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THE Journal of the Society of Arts, AND OF THE INSTITUTIONS IN UNION.

111th Session.] FRIDAY, JANUARY 27, 1865. [No. 636. Vol. XIII.

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Cantor Lectures.

"On the Reproduction of Natural Forms by Art and Manufacture." By B. Waterhouse Hawkins, Esq., F.G.S., F.L.S.

Mr. Hawkins will conclude his Course, on Monday Evening next, as follows:—

Jan. 30th.—Lecture V.—On Ceramic Manufactures, with the Influence of the material on the design and its successful production—modern Terra-Cotta, Della Robbia ware, Majolica, and Parian.

These Lectures are open to Members free of charge, and a Member has the privilege of introducing ONE Friend to each Lecture. A set of tickets for this purpose has been sent to every member.

Professor Ansted's Course of Six Lectures, on "The Applications of Geology to the Arts and Manufactures," will commence on Monday Evening, the 6th February.

Ordinary Meetings.

Wednesday Evenings at 8 o'clock.

Feb. 1.—"On London Sewage, from the Agricultural Point of View." By J. Chalmers Morton, Esq.

Feb. 8.—"On the Claims of Authors and Inventors to Property in and Protection for Designs and Inventions first published at Industrial Exhibitions." By Thomas Webster, Esq., F.R.S.

Art-Workmanship.

The following is a list of the Prizes awarded. The judges were Richard Redgrave, Esq., R.A., M. Digby Wyatt, Esq., and John Webb, Esq.:—

1st Division.

Works Executed from Prescribed Designs.

Class 1.—Carving in Marble, Stone, or Wood.

(*a.*) *The Human Figure.*—Work executed in marble or stone, after the Boy and Dolphin cast from a chimney-piece, ascribed to *Donatello.*—Four works sent in.—1st prize of £15 to G. T. Sherborn, 59, Ponsonby-place, Millbank, S.W.; 2nd prize of £7 10s. to Alexander Kenmure, 43, Pancras-square, N.W.

(*b.*) *Ornament.*—Work executed in marble, stone, or wood after a carved chair-back in the South Kensington Museum.—One work sent in.—1st prize not awarded; 2nd prize of £5 to James Stuart, 7, Pancras-square, N.W.

(*c.*) *Ornament.*—Work executed in stone, after a *Gothic bracket* in the Architectural Museum.—Three works sent in.—1st prize of £10 to T. V. Wran, 65, Lambeth-walk, S.; 2nd prize of £5 to John Barker, 7, Draycot-street, Sloane-square, S.W.

(*d.*)—Work carved in *wood* after a design by *Holbein.*—One work sent in.—1st prize not awarded; 2nd prize of £10 to W. H. Baylis, 69, Judd-street, W.C.

(*e.*)—Work carved in wood after the *Head of a Harp* of the period of Louis XVI.—One work sent in.—1st prize not awarded; 2nd prize of £7 10s. to T. E. Mayle, 17, James-street, Camberwell-new-road, S.

(*f.*) *Ornament.*—Work carved in wood after an *Italian picture frame.*—No works sent in.

Class 2.—Repoussé Work in any Metal.

(*a.*) *The Human Figure as a bas-relief;* after *Raphael's "Three Graces."*—Four works sent in.—1st prize not awarded; 2nd prize of £5 to W. Holliday, 14, Nailour-street, Islington, N.

(*b.*) *Ornament.*—Work executed after a Flemish salver in the South Kensington Museum.—Three works sent in.—1st prize of £5 to Septimus Beresford, 29, Myddelton-street, E.C.; 2nd prize of £3 to H. R. Batchelor, 149, St. John's-street-road, E.C.

Class 3.—Hammered Work, in Iron, Brass, or Copper.

Ornament.—Work executed after a portion of the Pediment of a Gate (German work, date about 1700), in the South Kensington Museum.—Three works sent in.—1st prize of £7 10s. to T. Winstanley, 10, Arthur-street, New Oxford-street, W.; 2nd prize of £5 to J. Zobel, 139, Euston-road, N.W.; extra prize of £2 to W. Letheren, Lansdown Iron Works, Cheltenham.

Class 4.—Carving in Ivory.

(*a.*) *Human Figure in the round.*— After an *Ivory*, by *Fiamingo.*—Two works sent in.—No first prize awarded. —Two second prizes of £10 each awarded ; one to J. W. Bentley, 22, Sherwood-street, Golden-square, W. ; and one to John Richards.

(*b.*) *Ornament.*—Work executed after a pair of *Tablets.* —No works sent in.

Class 5.—Chasing in Bronze.

(*a.*) *The Human Figure.*—Executed after a reduced copy of "*Clytie.*"—One work sent in.—1st prize of £10 to T. Nichols, 4, Everilda-street, Hemingford-road, N.

(*b.*) *Ornament.*—Work executed after *Goutier*, from a cabinet in the possession of Her Majesty the Queen.— Nine works sent in.—1st prize of £10 to R. E. Barrett, 26, Harrison-street, Gray's-inn-road, W.C. ; 2nd prize of £7 10s. to H. J. Hatfield, 16, Alfred-street, Tottenham Court-road, W.C.

Class 6.—Etching and Engraving on Metal—Niello Work.

Ornament.—Work executed after arabesques by Lucas Van Leyden, 1528.—Two works sent in.—1st prize of £10 to Gilles Mackenzie, 12, Tudor-street, Sheffield. 2nd prize not awarded.

Class 7.—Enamel Painting on Copper or Gold.

(*a.*) *The Human Figure.*—After *Raphael's design of the "Three Graces,"* excuted in *grisaille.*—No works sent in.

(*b.*) *Ornament.*—Executed after a German arabesque (16th century).—No works sent in.

Class 8.—Painting on Porcelain.

(*a.*) *The Human Figure.* — After *Raphael's* "*Two Children,*" in the cartoon of "*Lystra.*"—Seven works sent in.—No prizes awarded.

(*b.*) *Ornament.*—Executed after arabesques by Lucas Van Leyden, 1528.—Two works sent in.—1st prize of £5 to J. B. Evans, South-street, Mount Pleasant, Fenton, Staffordshire Potteries.—No second prize awarded.

Class 9.—Decorative Painting.

(*a.*) After an *ornament*, from *Castel R. Pandino*, near Lodi, from a drawing in the South Kensington Museum.— Two works sent in.—1st prize not awarded.—2nd prize of £3 to John Henk, George-street, Stoke-upon-Trent.

(*b.*) *Ornament.*—Executed after a *picture frame*, in the South Kensington Museum.—No works sent in.

Class 10.—Inlays in Wood (Marquetry, or Buhl), Ivory or Metal.

Ornament.—Executed after a specimen in the possession of the Hon. John Ashley.—One work sent in (metal). —1st prize of £5 to E. A. Millward, 35, Little Clarendon-street, Somers-town, N.W.

Class 11.—Cameo Cutting.

(*a.*) *Human Head.*—After *Wyon's* heads of the Queen and the Prince Consort, on the Jurors' medal of 1851.— Two works sent in.—1st prize not awarded.—2nd prize of £5 to James Ronca, 156, King's-road, Chelsea, S.W.

(*b.*) *Animal.*—Work executed after *Wyon's* "*St. George and the Dragon,*" on the Prince Consort's medal.—One work sent in.—No prize awarded.

Class 12.—Engraving on Glass.

Ornament.—Work executed after arabesques by Lucas Van Leyden, 1528.—No works sent in.

Class 13.—Wall Mosaics.

Human Head.—After *Bertini*, of Milan.

General competition.—Three works sent in.—1st prize of £15 to Samuel Cooper, Longfield-place, Hartshill, Stoke-on-Trent. 2nd prize of £10 to G. H. Stevens, Lambeth Glass Works, Carlisle-street, S.

Female competition.—One work sent in.—1st prize not awarded. 2nd prize of £10, to Miss E. Mossop, Windmill-lane, Brentford, W.

Class 14.—Gem Engraving.

(*a.*) *Human head.*—After an original in the possession of John Webb, Esq.—Three works sent in.—No prizes awarded.

(*b.*) *Full-length figure.*—After an original in the possession of John Webb, Esq.—One work sent in.—1st prize not awarded ; 2nd prize of £5 to John Wilson, 14, Leicester-place, W.C.

Class 15.—Die Sinking.

Human head.—After the head of the Prince Consort, by *Wyon*, on the Society's medal.—Five works sent in.— 1st prize not awarded ; 2nd prize of £5 to John Hatchett, 5, Gloucester-terrace, Kennington-park, S.

Class 16.—Glass Blowing.

Ornament.—After an original in the South Kensington Museum.—No works sent in.

Class 17.—Bookbinding and Leather Work.

(*a.*) *Bookbinding.*—After an Italian specimen in the South Kensington Museum.—One work sent in.—1st prize of £7 10s. to Louis Genth, 15, Broad-court, Bow-street, W.C.

(*b.*) *Leatherwork.*—Outside covering of a jewel casket. Original in the South Kensington Museum.—No works sent in.

Class 18.—Embroidery.

Ornament.—After a German example in the Green Vaults at Dresden, or an Italian Silk in the South Kensington Museum, No. 7468.—No works sent in.

2nd Division.

Works Executed without Prescribed Designs.

Wood Carving.

(*a.*) *Human figure in alto or bas-relief ; animals or natural foliage may be used as accessories.*—Twelve works sent in.— No first prize awarded.—2nd prize of £15 to Mark Rogers, 111, Tachbrook-street, S.W., for a carving, "Spring ;" a Child's Head. 3rd prize of £10 to James Griffiths, 8, Addington-place, York-road, S., for a carving, "Cain preparing his Sacrifice." Extra prize of £8 to T. W. Wallis, Louth, for a carving of a Child's Head, "Hope for the Future."

(*b.*) *Animal or still life. Fruit, flowers, or natural foliage may be used as accessories.*—Five works sent in.—2nd prize of £7 10s. to T. W. Wallis, Louth, for a carving of "Wagtail and Fly." 1st and 3rd prizes not awarded.

(*c.*) *Natural foliage, fruit, or flowers, or conventional ornament in which grotesque figures or animals may form accessories, preference being given where the work is of an applied character for ordinary decorative purposes, as representing commercial value.*—Nine works sent in.—No first or second prizes awarded.—Two third prizes of £5 each awarded ; one to George Murray, 6, Claremont-place, Henderson-row, Edinburgh, for a carving of a Frieze ; and one to W. M. Holmes, 101, Dean-street, Soho, W., for a Tripod-stand. Extra prize of £3 to George Lock, 26, Albert-street, Camden-town, N.W., for a carving of Festoons of Flowers.

An extra prize of £5 to Gerrard Robinson, 14, Duke-street, Manchester-square, W., for carvings of the human figure in the round.

Proceedings of the Society.

CANTOR LECTURES.

FOURTH LECTURE.—MONDAY, JAN. 23.

The argument which Mr. HAWKINS had endeavoured to sustain, on the three previous occasions on which he had addressed the Society, on the subject of the Reproduction of Natural Forms by Art and Manufacture, had been to show that the education of the hand, with regard to art, continues to be in excess of that of the mind. To attain to any degree of fame in the higher branches of art, the artist must possess some innate feeling, but as there were those who could write and speak good English without being historians or poets, so there were artists possessing a certain amount of good sense, which, when it had acquired good taste by education, could be of more real service to manufacturers than the highest ideal powers when not submitted to a well-regulated mind. But the artist who was intending to aid manufacturers must obtain some knowledge of the process and materials by which his works were to be multiplied. On the present occasion it was Mr. Hawkins's intention to call their attention to metal work. The various metals—iron, brass, copper, and the precious metals—were so constantly used in the every-day necessities of life, from the cottage to the palace, and in our churches and other public buildings, that there was a vast demand for the combination of art with these materials. Mr. Hawkins sketched on his black canvass several instances of defective designs in metal work, pointing out the paucity of invention, which induced our artists to become mere imitators. He censured the incessant use of reproductions of flowers in every material—wood, leather, gutta-percha, porcelain, and iron. He also showed how unfit feathers, flowers, and ribbons were to form part of the decorations of cast-iron gates; and even when water-lilies were introduced very appropriately into a design for a drinking-fountain, he remarked that had the artist exercised his thinking faculties he would not have placed these flowers at the top of a high arch formed by tree branches, in total violation of their natural position, which was floating horizontally on the surface of the water. Mr. Hawkins proved the necessity for a knowledge of the process of casting to those who design models for reproduction in metal, by demonstrating the difficulties which were often thrown in the way of the moulder by the inattention of the artist to the requirements of the process. If the designer had merely learnt to draw, and not to model, he would find great difficulty in adapting his designs so as to avoid "undercuts," which render it necessary to divide the mould, thus increasing the labour and adding to the expense without necessarily enhancing the beauty of the work. During Mr. Hawkins's lecture his observations on metal casting were illustrated by a workman, who was making a sand-mould from a group of aurochs, which Mr. Hawkins had modelled some years ago. This process the lecturer rendered intelligible by his outlines on the black canvass. On the next occasion (Monday, Jan. 30) metal will be poured into the mould, to complete the demonstration of the process of metal casting so useful to the designer.

EIGHTH ORDINARY MEETING.

Wednesday, January 25th, 1865; WILLIAM HAWES, Esq., Chairman of the Council, in the chair.

The following candidates were proposed for election as members of the Society:—

Bonnerjee, W. C., 108, Denbigh-st., St. George's-rd., S.W.
Hill, Frederic, The General Post Office, E.C.
Peckett, George, 10, Aberdeen park, Highbury, N.
Perkins, Houghton, 25, Mortimer-street, W.
Robinson, Noel Hooke, 6, Great Queen-street, S.W.
Rodger, Captain William, R.N., 9, Shawfield-street, King's-road, S.W.
Sancton, Philip, 28, Cumberland-ter., Regent's-pk., N.W.
Smith, Colonel John Thomas, R.E., 27, Cannon-st., E.C.
Stone, George Graham, 78, Holland-park, W.
Sudlow, John J. J., 8, Manchester-buildings, S.W.
Thompson, Thomas C., 42, Belsize-park, N.W., and Sherburn Hall, Durham.
Tomline, William, 5, Whitehall-yard, S.W.

The following candidates were balloted for and duly elected members of the Society:—

Haines, Alfred, Kensal-house, Harrow-road, W.
Knowles, S., Tottington, near Bury, Lancashire.
Mayson, J. S., Charlotte-street, Manchester.
Tremlett, Rev. Francis W., LL.D., The Parsonage Belsize-park, N.W.
Whitehead, J. B., Rawtenstall, Lancashire.

The Paper read was—

ON THE BEST ORGANIZATION FOR PROTECTING LONDON FROM THE RAVAGES OF FIRE.

BY CHAS. F. T. YOUNG, ESQ., C.E.

Fire, like the rest of the elements, when properly used and controlled, is an excellent servant and assistant to man; but, when it obtains the mastery, it is, as we find from past and continued experience, a most terrible and ruthless tyrant, destructive alike to life and property, and perfectly indiscriminate in its ravages. The palace and the hovel, the prince and the peasant, the old and the young, are equally open to its destructive influence; and it becomes the bounden duty of all to do their best to prevent its doing mischief, and confine its powers within those bounds in which it is found to act most beneficially for man.

Carelessness and wilfulness are the two best allies by whose influence it so frequently exceeds its bounds, and against these it is impossible always to guard; consequently we find, from the earliest ages, provision made for restitution or punishment, according to the origin of the fire, and in the case of wilfulness it was punished by death.

From a death by fire or burning we all instinctively shrink, and with reason, for a more fearful or terrific termination to one's existence cannot well be imagined; therefore, as when a fire once breaks out it is impossible to foretell the extent of its ravages, or the loss of life that may ensue, it is proper that the punishment of arson should be made most severe, and also that for culpable carelessness, the effect being the same though the motives may differ.

A large fire, especially amongst much inflammable material, is an awful and magnificent sight, and one usually as ruinous and fatal in its results as it is extensive and magnificent in appearance. In a few hours the labours of a lifetime, or even of a generation, disappear, leaving in their place a shapeless, useless mass of ruin, and the owners or dependents houseless or penniless, and frequently to commence again those labours and exertions that possibly another year or so would have rendered unnecessary.

To provide some means for counteracting these dreadful effects seems to have been a part of the business of every civilised nation from the earliest times; and there can be no reason to doubt that such means existed and were in use, in most of the celebrated cities of antiquity, such as Nineveh, Babylon, Tyre, and others; for it is difficult to believe that the engineers and mechanicians of those cities, whose talents and skill are so well known, would have omitted to provide some means of counteracting or extinguishing fires, the fearful ravages of which were well known and would be of such injury to their magnificent cities. That this was the case is rendered the more probable from our finding that Pliny the Younger wrote to the Emperor Trajan asking permission to establish a fire brigade of 150 men, into which he proposed to admit only those of that business: and we find him stating that the town of Nicomedia was burnt, because of the laziness or indifference of the inhabitants, and from want of proper machines or apparatus for extinguishing the flames. When ancient Rome was rebuilt, every citizen was required to keep in his house "a machine for extinguishing fire;" but what those machines were we are not informed. As in those days there were buckets, mops, hooks and syringes, it is reasonable to suppose that they were the latter; for we find that the dimensions of these squirts, when employed for extinguishing fire, were generally regulated by those of the building in which they were to be used. Pliny, in speaking of fire machines, uses the term "Sipho," which by some is taken for pipes or water tubes; but in a passage from a fragment of a work of Apollodorus, the architect to the Emperor Trajan, we are told when a fire occurs in the upper part of a house and the "Sipho" is not at hand, to take leather bags and fill them with water, connecting long pipes to them; and then, by compressing the bags, the water will be thrown to certain heights; therefore it is fair to say, from this description, that whatever the "Sipho" may have been, it was evidently a fire engine; for if such a rude contrivance as that described was applicable in its stead, it must be tolerably evident that the "Sipho" was an efficient machine for the purpose.

The ancient Romans, we are told by Suetonius, maintained bands of trained fire-men called matricularii, whose duty it was to extinguish fire; and there were also firemen in all the provincial towns. Petronius mentions their cutting away with axes, and throwing water from buckets at fires. To the ancients who lived nearly 2000 years ago we are indebted for the modern manual engine, which was invented by Ctesibius, of Alexandria, an engineer of that city, who lived in the 165th Olympiad, or about 120 years B.C. His pupil, Hero, of the same city, describes one in his "Spiritalia," which had metal cylinders—metallic pistons—spindle valves, with guards to prevent their opening too far—a goose neck, formed by a kind of swivel joint—something like a union or coupling screw—the application of an air vessel—two pumps forcing the water through one pipe—and one lever to work both pumps; all these are features, some or all of which have been revived and brought forward in modern times as great improvements or inventions.

It would be tedious, would take up too much time, and be foreign to my present purpose, to give a consecutive account of the different laws, ordinances, rules and regulations, made from these times for extinguishing or controlling fires, but they will be found fully treated of in a new work on the subject shortly to be published: therefore I propose to commence with what has been done to protect London since the Great Fire of 1666. The enormous destruction of property by this tremendous conflagration seems to have convinced the Government and City authorities of the imperative necessity of some well regulated means and appliances for the controlling of fires, and Acts of Parliament and Common Council were passed to obtain them. The city was divided into four districts; each of the twelve companies and aldermen were to provide themselves with brazen syringes, leather buckets, ladders, pickaxes, shovels, &c.; and, to obtain the water required for the engines and squirts, pumps were ordered to be placed in all wells, and fire plugs in the several main pipes belonging to the New River and Thames Water Works.

In the official report or account of the Great Fire, dated Whitehall, September 8th, 1666, it is remarked that "this lamentable fire in a short time became too big to be managed by any engines," thus showing that some other apparatus besides the hand-squirts must have been in use. These hand-squirts were worked by three men, one on each side to hold and direct, and one at the piston-rod to force the water out, just the same sort of thing as was used some 1800 years before!

In 1708, the 6th year of Queen Anne, it was enacted that "each parish shall keep a large engine and a hand engine, and a leathern pipe and socket of the same size as the plug or fire-cock (of the water mains), that the socket may be put into the pipe to convey the water clear to the engine," under a penalty of ten pounds. It also provided that the first person who arrived with a parish engine to extinguish a fire was entitled to 30s. reward; the second, 20s.; and the third, 10s.; provided the engines were in good order, "with a socket or hose or leather pipe." This Act, with the usual characteristic of English Acts of Parliament, contained no provision or regulation for the payment of the expenses of working these engines at fires, nor did it impose any obligation on each parish to take the engines to a fire; therefore, if the engines and required appliances were provided by each parish, the Act would be duly complied with, and they need not be used at all, but kept locked up, if it pleased the parish authorities to do so, without in any way contravening the provisions of it—a fine example of the legislative wisdom of the Solons of the 18th century.

In 1709, the owners and keepers of "other large engines" (not parish engines) were entitled to the same reward upon arriving with them and assisting in extinguishing a fire. In the same year, an Act was passed by which it was enacted, "That every servant by whose negligence or carelessness a fire should be occasioned, should forfeit one hundred pounds, or, in default, be imprisoned and kept to hard labour during eighteen months." In the case of setting fire to a house wilfully, it was made a capital offence, punishable by death.

From this time a period of nearly one hundred years elapsed, viz., to 1808, without any really efficient system for protecting the metropolis from fire being brought forward, or anything being done, except a little "tinkering" by Acts of Parliament, in relation to parish engines, &c. In 1808, however, Sir Frederick Morton Eden, the then chairman of the Globe insurance office, attempted to form a fire-engine establishment, for the protection of life and property from loss by fire. He proposed that each office should furnish 20 firemen; that all matters relating to appointments of firemen, and the business connected with the proposed establishment, should be managed by an Engine Committee; and that each office should pay an equal contribution towards the expenses of the establishment. By the end of the year, Sir Frederick was convinced of the time not being yet come, by finding that only one office, out of all the number, namely, the Atlas, could be got to join him; consequently he gave up the attempt.

About the year 1825, a union similar to that proposed by Sir F. M. Eden 17 years before, was formed by the Sun, Union, and Royal Exchange, who placed all their engines and men under one superintendent; and some time afterwards they were joined by the Atlas and Phœnix. On the 1st January, 1833, the London Fire Engine Establishment was formed, by ten of the insurance companies uniting, with the view of reducing the separate expenses of each office, and giving mutual assistance at fires. These ten offices were the Alliance, Atlas, Globe, Imperial, London Assurance, Protector, Royal Exchange, Sun, Union, and Westminster, and thus, after the lapse of a quarter of a century, was the system proposed by Sir F. M. Eden carried into practice, chiefly through the exertions of Mr. Bell Forde, a leading director of the Sun Fire Office, and the Brigade consisted of 80 men and 19 stations. Up to this period the engines and plant of individual offices, and those belonging to parishes, and some of the large private firms, were the only means available for use in case of fire; and at the present moment there exists no public means for this purpose, we being as it seems content to rely on private enterprise for that protection which it is the bounden duty of the public, and the public only, to supply; it being a matter of vital importance to the public, individually and collectively, that such means be provided and maintained in the highest state of efficiency

The protection obtained from the existence of parish engines is of the most ineffectual character, though there are some notable exceptions, such as St. Ann's, Soho, Hackney, Islington, and a few others, for we find, from the evidence given by Sir Richard Mayne before the Select Committee of the House of Commons in 1862 on Fires in the Metropolis, that they are "mostly at churches and workhouses, under the charge of beadles or private persons, who are paid a trifling sum by the parochial authorities. At great fires they are quite inefficient, and at trifling fires they are not wanted. There are 98 parishes in London which are bound by the old law to keep two engines in each parish; if they do it, it is no doubt done in an ineffectual manner." We also learn from the same evidence, that of the engines for which engine keepers and small rents are paid, one is said to be bricked up behind a blacksmith's shop, and if a fire happened where its services were required, part of the wall of the house would have to be pulled down to get the engine out. A man is paid for looking at it occasionally; possibly with the view of seeing it does not run away of its own accord.

Sometimes a parish engine may be seen running express to a fire, at the rate of about a mile and a-half an hour, pulled and pushed by half a dozen poor old worn out fellows from the workhouse, escorted by a crowd of all the little ragamuffins of the neighbourhood, and in such a state of perfect order and efficiency, that when arrived at the fire it cannot be put to work; this has actually happened under my own notice.

Dickens gives the following capital description of the progress to, and arrival at, a fire, of a parish engine:—"We never saw a parish engine at a regular fire but once. It came up in gallant style—three miles and a-half an hour at least; there was a plentiful supply of water, and it was first upon the spot. Bang went the pumps; the people cheered; the beadle perspired profusely; but it was unfortunately discovered, just as they were going to put the fire out, that nobody understood the process by which the engine was filled with water; and that eighteen boys and one man had exhausted themselves in pumping for twenty minutes without producing the slightest effect." My friend, Mr. Wm. Baddeley, whose thorough and practical acquaintance with London fires is so well known, writing on this subject in 1838, remarked, that "scarcely a week passes in the metropolis without the rehearsal of some such absurdity; and it has been my lot to witness many scenes of this description, even more abominably ridiculous than that which has been so graphically depicted by Boz." He also, in the same letter, stated that at the great fire in which the Royal Exchange was burnt, although there were no less than 17 fire engines within a few yards, one of the smallest engines only was brought up, and that, as a matter of course, would not work.

On several occasions, quite recently, we have had other examples of a most ludicrous character, two of which will be sufficient to prove the disgraceful state of inefficiency of the present parochial system of means for extinguishing fires. A fire occurred last year in one of the suburban districts of the metropolis, to which an engine was brought out, the hose were laid out, the levers fully manned, and worked up and down in a most enthusiastic manner, but all to no good purpose, for not a drop of water was thrown on the fire from the engine. A friend of mine came past at the time, and, not understanding the reason of the fire being left perfectly uncontrolled, stopped to see the cause, and found—it will hardly be credited—that the suction hose had taken the place of the delivery, and the delivery that of the suction. It is needless to say that the fire destroyed the premises in which it had broken out. In the next case the engine had been run to a fire some distance off, and when it arrived, and they began to see about getting to work, it was found that they had come away without any hose; consequently the engine could not be used. These would be looked upon as ludicrous in the extreme were it not that they are far too serious and important facts for other than melancholy consideration, and convincing proofs of our utterly unprotected state at the present moment—a state which is a terrible disgrace alike to our authorities and ourselves—to our authorities for not having long since devised and carried out an efficient means for the purpose; and to ourselves for suffering such a state of things to exist, especially as we have the remedy in our own hands.

It is worthy of remark, that the tendency of the fires of the present time is to become of far greater extent than formerly, and to cause far heavier losses; whilst our means of controlling them are not increased in proportion. It is a fact that most of the large London fires, within a few years past, have occurred in what are termed (almost in ridicule it would seem) "fireproof" buildings, having either originated in or extended to them; and as in these so-called "fireproof" structures the most valuable goods and materials have been stored, on account of the assumed security afforded thereby, the losses have been correspondingly heavy. When once the fire has got hold of one of these buildings it is found to be a waste of power to attempt to save it; and the exertions of the firemen have been found to be better employed in preventing the fire from extending to the adjoining premises. This was particularly the case in the great fire in Gresham-street, which annihilated the "fire-proof" building in which it originated. These "fire-proof" buildings are invariably found, in case of catching fire, to "hold" the fire, and by this means render their destruction, and that of their contents, a dead certainty; and they are to all intents and purposes most efficient "blast furnaces," whenever they, or rather their contents, unfortunately become ignited. It may be noted that floor-cloth factories, the inflammable character of whose contents is well known, are required to be built of wood, it being considered far better for the entire building and contents originally ignited to be destroyed, than by making them "fireproof," and of a nature calculated to hold the fire, to run thereby the risk of burning a whole neighbourhood.

For some time past we have heard that the Government were to bring in a Bill to give them power to create and maintain a system for controlling and extinguishing fires in the metropolis, absorbing the men and plant of the present establishment of the insurance offices; but there seems no probability of this at present, nor is it on the whole desirable, seeing that they (the Government) have already quite as much, or more, on their hands than they can conveniently manage; nor is it probable that it could be done by them in that mode which is best calculated to make the required protection thoroughly complete, and of the nature required by the public. In the "Fires in the Metropolis Bill" it is proposed to begin with a tax of £65,000 per annum. The next proposition is that the protection of the metropolis from fire shall be entrusted to the Metropolitan Board of Works, who are to be empowered to purchase the existing plant of the London Fire Engine Establishment and levy such necessary rate on the ratepayers of the metropolis as may be required to meet the expenses of maintaining it; but this is a proposition I feel sure will be opposed by all the parishes of the metropolis, and the ratepayers generally, for though the insurance offices would have to contribute towards its maintenance, still it would be impossible to control the expenditure in a satisfactory manner, or to fix a point which should be the maximum the ratepayers would have to contribute. I think that this proposal also will not be the one calculated to protect the public in the manner required, and it will be agreed by most of us that we have quite enough rates already for other purposes, none of which, it may be remarked, decrease in amount, and that any further increase of them, either in amount or number, is far from desirable.

As an example of what these rates and taxes might amount to in maintaining a force of men sufficient to control the fires of the metropolis, it is estimated that it would require a protective force of at least 500 men, in addition to the present staff (which would be only 1 in 6,000 of the population); and to keep up this staff as a paid brigade, would require us to be taxed for wages only to the extent of £37,000 per annum. This amount would of course be increased if more men were put on, and with London spreading out at its present rapid annual rate, it would not be very long before a larger sum would be required. Knowing, therefore, from present and past experience, how rapidly rates and taxes increase, it is but fair to assume that the extent and amount of a rate or a tax for the purpose of adequately protecting the metropolis from the ravages of fire, must be taken as an unknown quantity, but one nevertheless capable of unlimited extension; and for this very reason, if none other, we must one and all strenuously oppose it.

The Police Act does not and will not provide any appliances for extinguishing fire; and it is no part of a policeman's duty to make any attempt to do so, even when he sees it at the moment of the outbreak. The heavy police-rate (averaging 6d. in the £) will not admit of any men being spared for other duties than those of guardians of the peace; and even now we see frequent complaints in the public papers that their number is insufficient for this purpose. It is evident, then, that we cannot expect the required protection from the police, nor is it at all desirable that the fire-extinguishing arrangements of the metropolis should be left to them.

The time is evidently now arrived when the question of the most efficient, the cheapest, and easiest mode of thoroughly protecting the metropolis from the destructive ravages of fire, and providing a more effectual check to the tremendous conflagrations that have occurred so frequently of late, shall be set at rest; and the establishment of a truly Metropolitan Fire Brigade be accomplished; for, with the improvidence of an almost savage state of society, we have left ourselves at the mercy of the flames, and for more than a quarter of a century have shamefully neglected our duty in this respect, because the insurance companies arranged for extinguishing their own fires, by a set of men and plant; and to their inclination or otherwise we have trusted for help in extinguishing our own. It is neither just to the insurance companies, nor safe for ourselves, to trust wholly or even in part to their aid when fires occur. It should be remembered that their men and engines are designed and maintained by themselves simply for the protection of their own funds, and that there is no legal claim on them to maintain their establishment for the public benefit; but we have all grown into the false belief that we are entitled to look upon them as intended for the benefit of the public at large. No doubt, to a certain extent, they do confer this benefit; but all they can do with their present means and appliances, is far from sufficient for the daily increasing requirements; and we find that having to defray the cost of them, they stand, as is natural, on their undoubted right when they decline to augment it. What we now want is a complete and entire change of plan—one which does not inflict a compulsory maintenance of rates for the purpose, but brings into requisition that important and priceless principle—the VOLUNTEER SYSTEM—to whose energetic and chivalrous exertions we can trust with far greater certainty and satisfaction than to any paid system whatever.

It will, of course, be urged—as it was in the case of our volunteer riflemen—that they are not needed, that they cannot be made efficient, will not work as well as paid men, &c., &c.; and we have seen how all these sinister prognostications have failed. It may also be remembered that stronger reasons than these were urged against railways, and, in fact, against every improvement or "innovation," as it is termed, but, in spite of all that could be urged to the contrary, they have invariably, when once started, gone ahead, and their most persevering and strenuous opponents are found amongst their staunchest supporters.

The Volunteer riflemen, it should be remembered, provide for a danger afar off and yet to come; but the volunteer firemen are ready and willing to deal with one that is in our midst, and may meet us at any corner at any moment, and who can at this moment say that he may not, even while I am speaking, require their services?

The old proverb says, "one volunteer is worth ten pressed men." I prefer to place the word "paid" instead of "pressed." The negation of self has contributed more than anything to the success of volunteering. The sacrifice of time and money which has been made by those who have entered the ranks of our citizen-soldiers, has given a solidity, an *eclat*, and a prominency to the institution, which cannot fail to make it a most efficient weapon of defence for the country.

So far as the spirit of volunteering to carry out any really honourable and useful purpose goes, I believe it exists in the highest degree in this country, possesses a steady permanency, and a brilliant ardour; and it is only necessary to point out the direction in which it is required, to ensure its enthusiastic and perfect development. By the proper carrying out, in an efficient manner, of the system of Volunteer Fire Brigades, we shall have the proud reflection that we have around our hearths, and amongst us and our families, a brave, fraternal band, who do not work for pay, and will therefore work more effectively, heartily, and enthusiastically; and, being actuated by the true volunteer spirit, being implicitly obedient to orders, well equipped, and thoroughly acquainted with their duties, will hardly fail to render most important service in the hour of danger. By forming efficient Volunteer Fire Brigades, it should be remembered that we are not only protecting our own lives and property, and thus rendering ourselves more secure from loss, but are also assisting to protect the little all of those poorer and less fortunate neighbours who cannot afford to insure, and to whom the loss of that little all, how small soever it may be, is nearly always total ruin. It must be borne in mind that everyone is deeply interested in the quick and efficient repression of fires, and in furthering to the best of his ability any practical and efficient means for the purpose; but it is surely unreasonable to suppose that such a means cannot be easily carried into effect, provided all will lend an earnest and willing hand to do so.

It is constantly said that paid firemen will work better than volunteers, because "every man will perform his duty more energetically when he is paid." Now, I cannot, for a moment, admit that this is the case, and it will be very difficult to prove it. If paid men are best, how comes it that volunteers are always asked for when it is desired to do something very perilous or difficult—say spring a mine—storm a fort—lead a forlorn hope—rescue a shipwrecked crew—or some other hazardous undertaking? Surely, in such cases as these, where it is most important that everything should be well done, it must be admitted, from the above reasoning, that it is a mistake to allow the service to be performed by volunteers. The paid man, in all that he does, feels that he is giving an equivalent for that which he receives—and in practice will generally be found to give as much less as he can—but a very different feeling actuates the volunteer, for, as we have seen on hundreds of occasions, he throws such hateful considerations to the winds, and starts on his self-imposed task with a motive and an energy which a paid man can never know; and his unselfish exertions are certainly not less successful than those which some persons think require a pecuniary inducement to give them their assumed superiority.

Mr. Elihu Burritt, better known in this country as the "American blacksmith," now the United States' Consul at Birmingham, speaking of volunteer firemen, says, "it is one of the noblest objects aimed at that could nerve the manhood of brave men. The great battles they train themselves to fight, are midnight battles with the consuming fire; battles fought amid snow and ice in midwinter against the devouring element; charges hose in hand to pluck the burning homes of widows and orphans from destruction; battles in which there are ample scope and play for the best bravery of the human arm. These volunteer fire companies became so popular and numerous that there was one in almost every village in New England. In my own native town, with a population of about 6,000 souls, there were three of these trained bands, besides a juvenile company for even boys of twelve years of age, who would not wait, but formed a band by themselves for the drill and exercise. It is said that the Prince of Wales has manifested considerable interest in volunteer fire companies; perhaps what he saw in America will pre-dispose him to look favourably at their introduction into England. I have noticed that it is making a little stir in France; and I read the other day of the Emperor's reviewing a fire company at Vichy. One good company paraded in Hyde-park, well drilled, in attractive uniform, and with a highly-finished engine, and going through all the exercise and evolutions adopted on such occasions, I am sure would excite lively admiration, and I have no doubt that similar companies would be formed in all the large towns in the kingdom."

Now, if it be looked on as a meritorious action and an honour in the time of war, to assist at the peril of one's life in the destruction of life and property, because it is considered desirable to do so, it must at least be esteemed equally as honourable to risk one's life and limbs in the preservation of life and property in the time of peace. Let this once be granted, and we invest the position of a volunteer fireman with that honour and merit which are its just and proper due.

In Switzerland volunteer fire brigades exist, not only in cities and small towns, but also to a great extent in villages. The most respectable citizens vie with each other in eagerness and zeal to become members of such useful associations, which, however, consist of a fixed number of men. In some places the members are divided, a portion devoting themselves exclusively to the management of the fire engines, whilst others attend to the not less important task of taking immediate possession of the house on fire, saving what property they can and protecting the remainder. The order and method with which these volunteer fire brigades are conducted are deserving of the highest commendation, and their praiseworthy exertions are thoroughly appreciated by all who understand the motives of a volunteer fireman. In order that no delay may be experienced in taking out the engine to a fire, as sometimes happens from the temporary absence of the man in charge, two or three keys are distributed to an equal number of persons living near the engine-house, so that there may always be at least one key at hand when the engines are wanted.

"In several of the cities of Germany the whole of the householders of the district are members of a society for extinguishing fire, as well organised, as thoroughly drilled, and subject to as severe regulations as our militia or volunteers. The sound of the fire alarm bell calls each man to his post; the subdivision of labour is made; the nature and duties of that labour are known; system and science, as it may be termed, pervade the whole of their movements; seldom, if ever, does the fire extend beyond the place in which it originates, and very frequently it is extinguished without much mischief to the house in which it breaks out. It is a system and an association of this kind that we require in London."

The enormous advantages to be gained by the establishment of efficient Volunteer Fire Brigades throughout the United Kingdom, can hardly be sufficiently realised, the idea being a comparatively novel one; but of its superior economy there cannot be the least doubt. Let us take London for example, with an area of 700 square miles, on which the present fire engine establishment acts, which is assumed to be protected by 32 fire engines, nineteen stations, and one hundred and fifty men, costing the insurance companies some £27,000 per annum for its only partially efficient services, and let us supplement them by a well drilled corps of volunteers, some 500 or more in number, and with some 60 stations, and the requisite plant, judiciously distributed over the area of the metropolis, thereby affording equal and instant protection alike to the insured and the uninsured, at a cost to the insurance offices of less than half of their present contributions. The advantages gained by such a change would not be long in making themselves apparent.

From the evidence given before the Select Committee, we learn that the insurance companies paid for extra labour only at the great fire in Tooley-street no less a sum than £1,100, and this to utter strangers, men who knew nothing about fires, or salvages; and it has been admitted in evidence before the committee above alluded to, that the gratuitous services of the volunteers were most valuable.

Taking the present annual expenditure of the London Fire Engine Establishment, and dividing it by the number of calls to fires received within the year, we get nearly £17 as the cost of each run. By the volunteer system all this expense might be avoided, and each district in London could be protected by its 500 volunteers without any cost at all, and as each suburb springs up the means of protecting it would be immediately found, and that too without interfering with the more populous and endangered districts.

In London something of the kind I have proposed is becoming an absolute necessity; for it will be found that at each of the large conflagrations which have occurred of late, nearly all the men and engines belonging to the Fire Engine Establishment have been congregated, thus leaving the remainder of London totally unprotected, and in a state of the greatest danger. When we reflect that the metropolis is daily enlarging in extent, its trade and population increasing, and the value of its goods and merchandise becoming hourly of greater amount, added to which is the great and increasing loss caused by each fire from these very facts, whilst the existing establishment is less able to cope with them, and cannot afford to increase its power from the constant and great expense incurred in its maintenance, which does not decrease, we can form an idea of the importance of this question.

The great fire at Tooley-street (which continued burning for a fortnight), and the great number of others, almost as destructive, which have so frequently occurred since, cannot fail to have shown to the public the total inadequacy of the means at present provided for the repression of fires in the metropolis. The *City Press*, in an article in a number for January, 1863, says:—"We want more engines, more men, more steam power, a general fund of some kind, to which all shall contribute in the ratio of their possessions, and one source of power for the administration of the whole."

The system of volunteer firemen, to supersede the abominably deficient plan of protection by parish engines, or, as is too often the case, no sort of protection at all, and also the expensive though not more efficient plan of paid brigades, is taking a strong hold on the minds of the public, who are beginning to see that by manning their own engines they obtain that efficient protection, that energetic will to combat the ravages of fire, which can only be obtained under a well-disciplined system of volunteers, a system which on all occasions proves its enormous superiority to any paid system.

The *Post Magazine and Insurance Monitor*, of the 10th December, 1864, in speaking of volunteer fire brigades, says that many of its readers "will be as much surprised as we are ourselves at the number of these valuable voluntary associations that have been formed for the protection of property and human life against the terrible casualty of fire."

I find that we have in Great Britain, at the present moment, no less than 43 Volunteer Fire Brigades, with all their engines and appliances. Of these there are, in London and the suburbs, 11 brigades, with a total of 194 members; 19 engines, one being a steamer; and the power in the number of men required to work the manual engines represents 367 men; the total value of their plant and appliances being £8,670. The country brigades have 800 members; 70 engines, 1 steamer; representing a power of 1,200 men to work them; and the total value of their plant and appliances is estimated to be £14,000.

Of the country brigades, that of Alton was the first to employ a steam fire-engine, having obtained it at the close of last year; and the Lambeth Volunteer Brigade was the first to use it in London, having employed it nearly two years.

VOLUNTEER FIRE BRIGADES.

TABLE NO. 1.—COUNTRY.

Names of Places.	Population.	Members in Brigades.	Number of Engines.	Power of ditto in men.	Value of ditto and Plant.
Alton	4,121	24	1 steam. 3 manual.	20, 20, & 12	£650
Banbridge	4,000	13	1 „	22	300
Birmingham...	171,951	31	2 „	30 & 16	350
*Broughton ...	...	...	...	...	...
Buckingham...	4,020	17	3 „	20, 20, & 16	300
Buxton	1,235	20	1 „	22	300
Carnarvon......	9,883	10	1 „	30	300
Chester	28,000	29	3 „	30, 20, & 20	1,000
Cockermouth..	5,775	12	1 „	20	250
Coventry	38,536	67	1 „	22	250
Croydon (two brigades) ...	20,000	50	2 „	30 & 30	650
		19	1 „	22	250
Crystal Palace.	...	3	1 „	22	250
Frome............	12,916	50	2 „	...	400
Guildford	5,171	14	2 „	22 & 22	500
Hastings	11,219	60	3 „	20, 20, & 20	620
Holbeach	5,200	12	1 „	30	350
Horsham	6,056	75	2 „	20 & 20	350
Isleworth	6,143	...	1 „	24	200
Kenilworth ...	3,532	...	1 „	22	160
Leamington ...	15,750	28	3 „	30, 20, & 18	500
*Macclesfield ..	27,874	...	...	...	...
Margate	6,100	24	3 „	30, 20, & 2	500
Northampton..	23,500	30	3 „	26, 20, & 10	450
Peterborough..	8,200	12	1 „	22	200
Port Dynorwic.	...	12	1 „	20	250
*Saltaire	...	...	...	...	...
*Southampton.	...	...	...	...	...
Stowe	350	40	5 „	30, 20, & 18	1,000
Twickenham ..	6,254	6	2 „	...	250
Uxbridge	5,500	13	2 „	22 & 16	400
Wrexham	15,500	23	2 „	30 & 20	300

* No official return.

TABLE NO. 2.—TOWN.

When established.	Name.	Number of Members.	Number of Engines.	Power of ditto in men.	Value of ditto and Fire Plant.
1841	Burnett's	10	2 manual.	24 & 16	£1,000
1844	Price's	20	3 „	20, 20, & 18	2,000
1849	Beaufoy's	7	2 „	24 & 14	500
1851	Lambeth	8	3 „ 1 steam.	40, 40, & 28	3,000
1857	True Blue, Millwall	14	2 manual.	45 & 10	450
1858	Notting-hill	10	1 „	24	350
1862	Kentish & Camden-town	4	1 „	20	300
1863	Surrey	60	1 „	...	300
1863	Kilburn	6	1 „	...	300
1863	Prince of Wales, Hatcham	5	1 „	...	270
1864	Holloway	50	1 „	24	200
	11	194	18 manual. 1 steam.	367	8,670

ABSTRACT OF VOLUNTEER FIRE BRIGADES.

COUNTRY.

Number of Brigades, 31.
Number of Members, 800.
Number of Engines—Manuals, 70; Steam, 1.
Power of Engines, 1,200 men.
Value of Fire Plant, £14,000.

THE METROPOLIS.

Number of Brigades, 11.
Number of Members, 194,
Number of Engines—Manuals, 18; Steam, 1.
Power of Engines, 367 men.
Value of Fire Plant, £8,670.

TOTALS

Brigades, 42.
Members, 994.
Engines—88 manuals; 2 steamers.
Power, 1,567 men.
Value, £22,670.

In contrast to London, with its population of over 3,000,000; an area of nearly 700 square miles to protect; its paid fire establishment of 150 men; some 32 engines; and 19 stations; and a property of the rateable value of over £900,000,000, let us place the city of Paris, with its population of 1,696,156, where we find that they have a force of 1,270 men, 130 stations, and 180 engines and fittings; all the men are soldiers, and, as is usual in that country, everything is done on the military plan. For the volunteer system, it will be sufficient to take the city of New York—not including Brooklyn and Jersey City, both having their own fire companies—where the means for controlling fire consists of Volunteer Engine, Hose, and Hook and Ladder Companies. The population of New York City is about 1,000,000, and we find that they have 55 engine companies and stations, 27 steam fire engines and appliances, 40 manual engines and appliances, 62 hose companies, with their appliances; and 19 hook and ladder companies. The men in each engine company vary in number, some companies having as low as 18 and others as high as 50.—Total firemen, 2,393. The hose companies, of which there are 62, have from 18 to 25 men in each company.—Total hose men, 1578. The hook and ladder companies, of which there are 19, have from 17 to 40 men in a company.—Total hook and ladder men, 640, giving a grand total of men engaged in controlling and extinguishing fire in New York City alone, of 4,611 men. Attached to the engine companies are 32 hose tenders and 17 fuel tenders, all on wheels, and the hose companies have 53 hose carriages and 42 hose tenders; whilst the aggregate length of hose for the engines is no less than 15 miles 103 yards, or enough to reach from the Royal Exchange to Dartford in Kent. These particulars are derived from the report for 1863, of John Decker, Esq., Chief Engineer to the Fire Department of New York, and form an astounding contrast to the state of things at present existing in London. The particulars of the Sapeurs-Pompiers of Paris have been obligingly forwarded, at my request, by Mons. J. Lebélin de Dionne, "major-ingénieur" of that corps. Being a Government establishment they do not publish a report for circulation, but the abstract of the corps, and the fires of the past year, have been copied out of the records.

Once introduce the system of Volunteer firemen, under efficient and judicious management, carefully selecting as members only those physically qualified, and training them properly with an efficient system; and there cannot be the slightest reason to doubt their becoming as important a body as our volunteer rifles, whilst, from being actuated by a very different spirit to that which exists amongst paid brigades, they will do their work in a smarter and more efficient manner, with far less damage by water, and an increasing desire to do better on every occasion when their services may be called into requisition. It cannot fail to prove most advantageous for Government, the insurance offices, and the public, to support and encourage the volunteer system, which in Germany, Switzerland, America, Australia, and elsewhere is considered far superior to any paid system, and is found to give most excellent results, for by it any number of firemen can be obtained at a cost not depending on their number but simply on the rent of the number of stations established, and the expense of maintaining the engines and plant at these stations.

We have seen that Government admits the necessity of more extended and efficient means for controlling the fires of the metropolis (of which a most convincing proof was afforded by the celebrated conflagration at Tooley-street), by their proposal for a Bill for this purpose, but which seems just as far from becoming a fact, as when first talked about.

By establishing volunteer fire brigades in London, and also in all towns in the United Kingdom, with proper plant and appliances, and zealously contributing, according to our means and time, towards their establishment and maintenance, we remove the great difficulty out of the way of the government, namely, that existing between the government and the fire insurance companies, contributing to the London fire engine establishments, as was stated by Sir George Grey at the close of the late session, and given by him as a reason why the government bill was not brought forward. It seems to me that the Government might give a sum of money to be applied to the purchase of steam fire engines and appliances, and a certain annual grant for their maintenance, the rent of the stations, and other expenses, in return for which they would be worked and kept in order by volunteers who would find their own uniforms, and have a section constantly on duty, night and day, at all stations, so as to be ready to run out to a fire the moment a call is received. It cannot, I should think, be urged for a moment that such money would be badly applied, or that government ought not to grant funds for this purpose. The same plan might be adopted in regard to the engines and plant, as is followed when cannon, rifles, &c., are served out to the volunteers, but they should be commanded by their own officers, who should be paid out of the funds of the corps, and devote their whole time to the business; and except that the property of the engines and appliances would be vested in the Government, the whole should be, and be strictly maintained as, a volunteer undertaking in all respects.

If we take the rapid progress made by the volunteers in their drill and exercise as a criterion of what can be done by them when they take a thing in hand, we have every reason to believe that we should soon have a large number of most efficient firemen; for after all, the controlling and extinguishing of fires is a far more common sense proceeding than it is generally believed to be; and if it is possible to make ten skilled firemen, then it is equally possible to make one hundred or one thousand, especially where one has the common sense and intelligence invariably found in volunteers to deal with, and let Government give a grant to supply and maintain the stations and plant, and we will soon show them what can be done in the way of making a truly Metropolitan Fire Brigade.

As to the success of such an undertaking, let us take the Royal Society for the Protection of Life from Fire—and a more invaluable society scarcely exists—which we find is entirely supported by voluntary contributions (of more than £10,000 per annum), and the men who attend the escapes are actuated by the volunteer spirit, or they could scarcely perform the meritorious actions we so constantly hear of their doing, did they only work for their pay. If such a society as this, whose importance and advantages we all of us freely admit, can be supported by voluntary contributions, we surely cannot for a moment say that such an important and valuable institution as the Volunteer Fire Brigades cannot be equally supported.

I appeal to all, ladies and gentlemen, small and great, for a hearty and willing support, in return for which they will be amply protected from the dangers of fire by the Volunteer Fire Brigades, and also have the satisfaction of knowing that they have thereby assisted in enabling protection to be brought near to others, who otherwise might never obtain it.

We are one and all equally interested in carrying out this institution, as we shall otherwise have but one course open, namely, to pay heavy rates for the protection of endangered property owned by commercial men; but by supporting the Volunteers, it is not too much to say that under good and efficient management, and with a proper system to work on, her Majesty's Government would look with a favourable eye on them, and encourage them as they did the Volunteer Riflemen.

There are two old proverbs, which apply with peculiar force and aptitude to the question of the proper and efficient mode of protecting London from the ravages of fire. The first is, "If a thing is to be done well, do it yourself;" and the second is, "What is everybody's business is nobody's business."

As an exemplification of how well a thing can be done when we do it ourselves, look at our volunteer riflemen, and the manner in which they have sprung up, learned their duties, and become a most important and efficient safeguard to the honour and power of the nation; and this, too, in spite of every prognostication to the contrary.

Let us, I say, have another example—in our volunteer firemen—of the truth of this proverb. Let us say we *will*, and assist to the best of our ability, and by our purse, our influence, and our time, those who are willing to take the labour and trouble of starting the movement, and putting it into shape, and the rapidity and certainty with which the system will be established cannot fail to be surprising and gratifying to all who have put their shoulders to the wheel.

The truth of the next proverb is most amply proved by the fact, that up to the present time we find no one has taken the subject up in the manner which its importance demands; nor has anything been done, except in isolated cases, to extend the means of controlling the London fires. It is evident from this that "everybody" is "nobody;" it remains, therefore, for us to eliminate "nobody" from the mass, in order to change this state of things; and if we leave "nobody" out of the calculation, and "everybody" will help "somebody," I shall have pleasure in taking his duties upon me, feeling sure that "nobody" will object to "everybody" doing his best to carry out the movement, and aid it to the best of their ability, and in concluding the paper I have just had the honour of reading, I will remind you of the appropriate words of the immortal Nelson, that "England expects that every man will do his duty."

DISCUSSION.

Mr. **Webber**, whilst admitting the necessity of some additional means for the suppression of fires, could not concur in the suggestions offered in the paper just read. Some years since he visited America, and one night, in New York, he was awoke by the loud ringing of a large bell. On inquiring the cause of the disturbance, he was informed that it arose from one of the public fire establishments. With regard to the volunteer system, he thought, if a thing was worth having at all it was worth paying for. He had not been in New York more than ten days, when a very disastrous and rapid fire broke out in the Broadway; and although it did not last more than about an hour, no fewer than fourteen people lost their lives at it, all the sufferers being members of the Volunteer Fire Brigade; and it was stated in one of the newspapers that the larger number of these volunteers were not present at the fire for the purpose of suppressing it, but only for the purpose of plunder. Another instance was mentioned of a disastrous fire that took place during a banquet, and which was said to have been occasioned wilfully, in order to give the volunteer firemen assembled at the banquet an opportunity of displaying their valour and skill. He did not for a moment suppose that anything of the kind would ever occur in this country, but he was merely stating what he had experienced in America; although at the same time he thought some almost equally objectionable results would arise here from relying entirely upon the volunteer principle in the suppression of fires. When that principle obtained in this country with regard to the police—for at one time every tradesman was a constable—they had nothing like so efficient a body of police as they had under the existing paid system. His own opinion was that fire brigades, to be effective, must be paid for the services they rendered.

Mr. C. F. **Dennet** felt called upon by the remarks just made to speak out for his own country. He was a native of Boston, U.S., and he had been a volunteer fireman there; and as a member of that society for many years, he was glad of this oportunity of giving his testimony in favour of the principle advocated by Mr. Young. With respect to the slumbers of the last speaker having been broken by the ringing of a bell in the night, he would say it was a good thing that in America, where the houses were somewhat slightly built, that a bell should be rung in the streets as an alarm of fire. By the improved system of organization that now prevailed in Boston and other American cities, the call to a fire was made by telegraph to the various stations, and the engines were started off with their attendants in the shortest possible time. In all the large towns, hydrants were placed at suitable distances through the leading thoroughfares; and in the smaller towns there were reservoirs containing many thousand gallons of water ready for use in case of fire, and the suction hose of the engine had merely to be placed in the reservoir to be brought into immediate action. Each volunteer brigade was under the command of a superintendent, and the whole was under the control of the municipal authorities. The superior officers of the brigades were chosen by the corps themselves from amongst the most efficient members, and every night there were hundreds of men in every town ready to do duty, in case of fire, at a moment's warning. The engines and equipments were the property of the town, but they were committed to the keeping of the volunteer brigade, amongst whom a friendly rivalry existed in the decorations of their respective engines and apparatus. Some of the brigades took a pardonable pride in those decorations; and in some cases the ornaments on the engine were of a costly character. In one instance the pipe which discharged the water was of solid silver. At least once a month the brigade was assembled for the inspection of the engines and entire apparatus, as well as for practice; and connected with the corps were associations both of a literary and benevolent character. The necessity for the extension of this system in London was shown by the scanty organisation that at present existed. Mr. Young had shown them on the map how few volunteer fire brigades had been established, and how ill-provided were many parts distant from the centre of the regular brigade. With respect to his own locality, the further side of Hyde-park, such protection as existed in that quarter was due to Mr. Dunsford, who had raised a volunteer brigade at Notting-hill. Within the last few years property to the amount of a million and a-half had been put up in that neighbourhood, and some of the buildings were erected with such slight materials that if a fire occurred at the bottom of the house it was almost certain to go right through the building in a very short time. He was a strong advocate for the volunteer system, but whether it could be carried out efficiently in this metropolis was a question for discussion. He thought the subject was of sufficient importance to warrant the appointment of a commission to visit America and other parts of the world in order to see their systems, and whether anything of value could be derived from them applicable to the case of the metropolis. As an Anglo-American, he had often been struck with the total insufficiency of the fire establishment in London, and it behoved them to adopt a more efficient mode than at present existed for protecting themselves and their property from the dangers of fire.

Dr. **Bachhoffner** thought there could be but one opinion as to the extremely inefficient state of the fire departments of the metropolis, but whether the volunteer system would meet the difficulty he was not prepared to say. With respect to the observations of Mr. Webber, he would only say that, though he was not prepared to gainsay his statements, he thought it was wrong to condemn the system as a whole because there were some unworthy members in those brigades; he was, however, quite sure that such cases as had been mentioned would never occur in this country. With reference to government interference in this matter, the paper led them to believe that that idea had been abandoned; but he thought that was a mistake, and that the approaching session of Parliament would not close without a bill being introduced by the Government investing in the Metropolitan Board of Works the entire control of the fire establishments of London. Ably as the existing fire brigade was conducted, he thought the system was extremely unsatisfactory. Some, only, of the insurance offices contributed towards the maintenance of the regular fire brigade; moreover, the late Mr. Braidwood stated, in his evidence, that if a fire broke out at the British Museum, although it was known that building was uninsured, the brigade would attend that fire; but if another fire broke out at the same time in an insured building, they would leave the British Museum, and direct their efforts to the suppression of that fire. He had no doubt, if the project which was at one time entertained, of the amalgamation of the city and metropolitan police forces had been carried out, that measure would have been followed by the handing over of the fire department to the police, but there was difficulty in the way of doing that so long as two independent bodies of police existed. It was estimated that the cost of an efficient brigade would be £60,000 or £70,000 per annum, but from data in his possession he believed it would be nearer £160,000, of which amount it was estimated the parish of Marylebone would contribute about one-twelfth, which naturally induced the parishioners to set their faces against such a measure, particularly as there were in that parish two very efficient fire engines. He thought there was something radically wrong in the present system of attempting to extinguish fires; the volume of water thrown on was not sufficiently large. Attention should therefore be directed to the furnishing of some means by which a larger amount of water could be thrown into a burning building. With regard to the volunteer brigade movement, he wished it every success.

Mr. **Clarkson** considered that greater attention should be paid to the prevention of fires, by having properly-constructed buildings, and also the providing of means whereby a fire could be acted upon immediately it was discovered. When a fire took place in Paris there was seldom more than a room burnt out. Owing to the careless manner in which lights were used in large warehouses it was not surprising that fires were of frequent occurrence; and he considered that the great preventive of extensive conflagrations was not in the number and efficiency of the fire brigades, but in the ready means of attacking a fire within the buildings in which it occurred.

Mr. **Payne** would be the last person to find fault with the London Fire Brigade, but the fact was they were totally inadequate in number and appliances to the work which was assigned to them. Moreover, the report of the surgeon of the brigade proved that a large amount of sickness existed amongst the men, caused by the overwork which they had to perform. The great point to be considered was the means by which a more adequate system could be established, and in whose hands the control of that department should be placed. If under the Board of Works, the taxation would be specially heavy; if under the police, their present duties would be neglected. With these considerations he thought the only quarter to which they could look for a remedy was the volunteer system. He trusted the time was not far distant when not only the metropolis, but every town in the kingdom, would have volunteer fire brigades.

Mr. **Walter Newall** thought nothing should be said in disparagement of the existing fire brigade of the metropolis. The late Mr. Braidwood and Capt. Shaw had shown what could be done with the very limited means at their command. Taking the extent of London as

13 miles long and 9 miles wide, that gave an area of only 117 square miles, instead of 700 as stated in the paper, over which the operations of the Fire Brigade extended. The insurance offices having shown a desire to relieve themselves of the burden of maintaining this brigade, the proposition might, perhaps, take the shape that government should contribute one-third of the cost; the ratepayers one-third; and the insurance offices one-third. A rate of a penny in the pound extended over the metropolis would produce upwards of £60,000. Having been for a long time connected with the administration of the building acts, he had arrived at the conclusion that greater attention should be paid to the construction of houses, particularly as regarded party walls. Great security also resulted from maintaining a constant pressure of water in the street mains, so that a jet of water 60 feet high could be directed upon a fire at the moment of its discovery, and before the engines arrived at the spot.

Mr. W. H. Dalton, as a member of the Board of Works, begged to say a few words on behalf of that body. He would state, in the first instance, that they had done nothing whatever to seek the control of the fire brigade. The Government had asked them whether they would undertake that duty, and, as a municipal body, they felt they ought not to refuse it. For his own part, he could say he had no desire to share in that additional responsibility; but if the Government and Parliament thought it should be undertaken by them, they could not do otherwise than accept it. It happened that only a certain number of the insurance offices contributed towards the maintenance of the fire brigade, while others refused to do so. Those who did contribute felt it a burden upon them, and were not disposed to continue their contributions. When this subject was brought before the Board of Works, the opinion was generally expressed by the members that, inasmuch as the insurance offices made large profits out of their business, they ought to contribute a share to the cost; and that Government, having large public buildings, should also largely contribute. With reference to the Association for the Protection of Life from Fire, he would say, although the funds were raised by voluntary subscriptions, the men who conducted the fire-escapes were not volunteers, but were regularly paid for their services, and in the event of the control of the Fire Brigade being placed in the hands of the Board of Works the association he had alluded to had requested them to undertake the control of that business also. As far as the volunteer brigade system had gone, it had been very efficient, but the brigades had been to a great extent instituted by men of large means, who had valuable properties of their own to protect. For his own part, however, if the work could be done efficiently by volunteers he would rather see it in their hands than in those of the Board of Works.

Mr. A. Stewart Harrison said having been in New York, Boston, Chicago, and New Orleans, he could state with regard to volunteer fire brigades that whereas in Boston they were drawn from what was termed the respectable class, in New Orleans and Chicago they were drawn from the lowest classes of the labouring population. The results were such as had been alluded to by Mr. Webber, for at a fire in Chicago he had himself seen men engaged in rifling chests of preserved ginger instead of assisting to put out the fire. In this country, however, it might be assumed that the volunteer fire brigades would be drawn from the respectable classes of the community, who would render as efficient services as he had seen rendered by brigades of that character in New York and Boston. He agreed with a previous speaker, that the great point was to have means at hand of attacking a fire at the moment it was discovered, as a quarter of an hour after the outbreak tons of water would be of little use in extinguishing it. It was a fallacy to say that insurance covered the losses by fire. They were simply spread over the shoulders of the many, but there was the actual destruction of so much property, which tended to enhance prices, so that the loss fell upon the public generally, and heaviest on the poorer classes of the community.

Mr. T. Jones remarked that it was evidently intended, from the course of legislation on this subject, that there should be a volunteer fire brigade in every parish, because it was enacted that in every parish a fire-engine and ladders should be provided, which implied that there should be persons to work them, but it was no part of the law that they should be so small as to be comparatively useless. He thought it would be quite competent for parishes to organise a proper fire establishment within each paving district, and these, with volunteers in addition, would form the *nucleus* of efficient brigades throughout the metropolis and provincial towns.

Mr. S. Teulon said it was impossible to discuss the question of protection from fire in a city like London without feeling it was one of the most important subjects that could occupy their attention. It had been stated that unless water was applied at a very early stage of a fire it was very little use applying it at all, and, therefore, it occurred to him that the readiest mode of obtaining a supply of water to be directed upon a fire would be from high pressure in the street mains, with a hydrant placed at the bottom of each lamp-post. Objections had been made to employing the services of the police in this work. He would have them trained to the use of the hose, so that a fire might be attacked at once from the hydrants; but when the trained firemen arrived they should give way to them, and simply take the duty of keeping off the crowd. With reference to the volunteer system in this country, there was no doubt that, as regarded the rifle corps, it had been a great success, but the secret of that success consisted in the government having placed the highest officers in the regular army at the head of that force; so in the case of volunteer firemen, there must be an organized authority to which all parties must bow. They read in the history of the Great Fire of London, that the King deemed it his duty, as the chief authority of the kingdom, to attend personally and do what he could to mitigate the evils of that great conflagration. The custom prevailed very generally throughout the continent for the chief authorities of a town to give their attendance at fires. It was especially the case in Sweden. He (Mr. Teulon) was present at the fire which destroyed nearly one-third of the City of Gottenburg, where the exertions to subdue the flames were encouraged by the presence of the leading authorities of the place. It was the case also in Switzerland. In Sweden, it was customary for alarms of fire to be given by a watchman, stationed on a steeple or other high building, blowing a loud blast from a trumpet, by which the inhabitants were summoned to give their aid.

Mr. Cox (of the Holloway Volunteer Brigade) said, having been for many years a volunteer fireman, both in Australia and in this country, he was of opinion, judging from his own experience, that the brigades required no other head than that which was universally recognised in the captain of the brigade, in whose judgment and experience the men had confidence. He could bear his personal testimony to the excellent working of the volunteer brigade system in Australia. His experience was that water would not always stop a fire, and that in many cases the most effectual check would be given by pulling down buildings in advance of the direction in which the flames tended. In such operations the services of the "hook and ladder" corps were very prominent, as he had himself seen in a great fire at Ballarat. He expressed himself highly favourable to hydrants in the streets, a system that was carried out in Melbourne through all the principal thoroughfares, at distances of 200 yards. He had the highest opinion of the value of the volunteer fire brigade system.

Mr. Roberts (True Blue, Millwall Brigade), as an old volunteer, would say a few words on this subject. With regard to the strictly self-supporting system advocated by Mr. Young, that gentleman forgot that the supplying of their uniform at their own cost, with other expenses, involved considerable sacrifice on the part of the working men who formed the majority of the brigades; and, speaking with some experience, he was afraid, after a few years, the brigades would not find the subscriptions come in so readily as they did at first. With respect to the brigade of which he was the head, he could state that they had not received a penny from anyone for their services. In reply to what had fallen from Mr. Webber, he would say, better the slumbers of a whole town should be disturbed by the ringing of bells than that one life should be lost by fire. As to the method of attacking a fire, he was old enough in the service not to study show in such matters. It might be a tempting opportunity for a new brigade to show how high their engine would throw the water. His rule, however, was to "fire low," and attack the fire from the bottom. With regard to the best means of protecting buildings from fire, he confessed he had very little faith in the experiments that had been made with gases and salts as fire-annihilators. If they had those matters at hand the moment a fire broke forth they might put it out, but when fire had got hold, such appliances were of little or no use. As to the police having to do with fires he strongly objected to it, and the most essential service they could render was in keeping back the crowd. The chief difficulty on arriving at a fire was to get the engines at work, and on some occasions he had been obliged to clear the way by knocking people down. He agreed with the opinions expressed that the brigades should have some recognised head. He should be glad to see the volunteer brigade system extended throughout the country, and he hoped before long to see an Act of Parliament making it compulsory upon all parishes where a brigade was established, to provide sufficient engines and apparatus. He was sure there would be no lack of men to work them.

Mr. G. F. Wilson, F.R.S., said, having had opportunities of witnessing the working of the brigade which stood second on Mr. Young's list, established in 1844, he was bound to say, moving as this brigade did within a rather limited area, it had experienced no difficulties whatever, either with the London Fire Brigade or the police, and on occasions when they had co-operated with the former, they spoke in the highest terms of the assistance they received from them. Therefore he was disposed to think that, with harmonious action between the volunteers and the regular brigade, a most valuable aid would be afforded to their present means of combating fires in the metropolis.

After a few words from Mr. Wentworth Scott,

The Chairman said, before calling on the meeting to pass a vote of thanks to Mr. Young for the paper with which he had favoured them, he would remark that they ought, before they decided as to what was the best course to pursue, to think of how gradually the present system had grown up, until it had arrived at a point where it appeared to have become necessary that there should be some general organisation for controlling the ravages of fire. Originally each parish was bound to provide engine-power, and the voluntary services of people were looked to to work that power, and it might be said that the new system advocated by Mr. Young was only an extension of this principle. From the vast amount of property accumulated, and the great increase of buildings, the existing system had become inadequate, and he hoped, if a return to the voluntary principle was made, this would be done in such a manner as to be most useful to the public. Some years since the parishes having been found wanting, both as to mechanical power and volunteer force, there arose the interference of the insurance companies; and undoubtedly, if they were to have an unauthorised body, without public responsibility, they could not organize a force which had so much inducement to do its duty as one employed by the offices who would have to pay the damage done by the fire. To them it was a duty undoubtedly. Generally speaking, they performed it efficiently, but they found they were now in this position, that so vast was the extension of property, and so large an amount of it was not insured, that when two or more fires occurred at the same time, it was doubtful whether the uninsured would not be neglected for the sake of the insured property. They then came to two proposals, which might be considered together. The first was to place the control of this matter in the hands of the Government, and the second was to entrust it entirely to a volunteer body. They must, he thought, feel a strong objection to giving this power to the Government. He was one of those who thought the inhabitants of a municipality did what they required better for themselves than it could be done by the Government. But there was an important institution recently sprung up, the Metropolitan Board of Works, which, notwithstanding the disparaging remarks that were often made, was discharging its duties with great ability, and to whom it was proposed to entrust the management of these affairs. The question was, would that be more efficient than the volunteer system? The merits and demerits of that system had been thoroughly stated by the veteran volunteer from Millwall. He had said the volunteer brigade, while it was a novelty, was well supported, but now he found that support begin to flag. Some pecuniary aid appeared to be called for, and some authorised head under whose guidance the whole should work. Placing the volunteer fire brigade in comparison with the military volunteers, they both began much in the same way. The rifle movement was, in the first instance, carried on solely at the expense of those who volunteered; but it would not have remained as efficient as it is now if the Government had not interfered—first to place it under well-advised arrangements, and then to afford it such an amount of pecuniary assistance as enabled it to meet the difficulties which now appeared to arise in this other system. To a great many the cost of uniform would, no doubt, be very agreeable expenditure, but it might be different with many others whose services would be most valuable, and who might, from pecuniary considerations, be prevented from joining the corps. Looking at the manifest deficiency of the present system, he confessed he thought that a volunteer brigade, with a proper head (such as Captain Shaw, with whom should rest the appointment of subordinate officers), combined with a limited amount of pecuniary aid from the Government, would render very effectual service. He thought, however, that it was a mistake to suppose that the present fire brigade ever measured their work by the amount of their pay, or that any consideration of remuneration affected the willing discharge of the duties imposed upon them. They must all feel that the object was to improve an important institution of the country which had been neglected, and which he hoped the paper and discussion of that evening would tend to put before the public in a more satisfactory position than it had hitherto held. He was sure they would unite in a cordial vote of thanks to Mr. Young for having so ably introduced the subject to their notice.

The vote of thanks having been passed,

Mr. Young acknowledged the kind reception that had been accorded to his paper, and in reply upon the discussion, said he regretted that the remarks had wandered very much from the subject he had desired to introduce, viz., the difference between volunteer and paid brigades. The first speaker had spoken disparagingly of the "hook and ladder corps," but probably that gentleman was not aware that in Paris they used nothing but hooks and ladders, as was shown in a work published under the sanction of the Minister of War, entitled, "The Fireman's Manual." Dr. Bachhoffner had stated that only a certain number of insurance offices contributed to the brigade, but there were thirty who did so at the present time. He fully confirmed the statement of that gentleman as to the efficiency of the fire arrangements in the parish of Marylebone. In reply to Mr. Newall, as to the area over which the London Brigade extended, he would state that they did not confine themselves to the metropolis, but they set themselves out to work over 700 square miles within and around London, even as far as Windsor, Dover, and Gravesend. With regard to fire-proof buildings, he denied that such a thing existed in practice, as was shown by the great fire in Gresham-street. Mr. Dalton stated that the Board of Works did not wish to have the control of the fire establishment; he was very glad to hear it, and hoped the unwished-for duty would never be thrust upon that body. Mr. Teulon approved of the interference of the police at fires. Their instructions were to hold the door and keep people out of the house, for which services they were paid a sovereign. He (Mr. Young) agreed that the volunteers should be organised under one head: he also concurred with the remarks of Mr. Roberts with respect to the cost of uniforms. With regard to the statement that there were fewer fires in Paris than in London, the last report showed that last year there were 1,899 fires in Paris, and only 1,624 in London. The serious fires in Paris during that period, however, amounted to only 570, and there were only 20 cases of total loss. Out of the 1,899 cases of fire about 1,300 were mere chimneys on fire. Of the fires in London 14 per cent. had been total losses. Without disparaging the services of the paid brigade, he preferred the volunteer system, for if a man put his soul into the work he would work better than one under compulsion.

Mr. Stewart Harrison exhibited an arrangement for extinguishing fire in buildings at its commencement. It consisted of a reservoir and pipes, with valves at intervals throughout the building, so arranged that the valves are kept tight by plugs of fusible metal, and consequently, as soon as the temperature in any room reaches 212°, the plug is melted and the valve is opened, allowing of the escape of water. At the same time an electric circuit is completed, and alarum bells rung.

Proceedings of Institutions.

South Australian Institute.—The annual report for 1863-64, presented at the meeting held on October 11, 1864, states that a steady progress has been made in most of its important branches. The new Institute Act, which was referred to and its provisions explained at some length in the last report, was passed during the last session of Parliament. A meeting of the subscribers to the Library was held, as directed by the new Act, when, in December, 1863, J. P. Boucaut, Esq., was chosen to fill the office of Governor. Four quarterly soirées have taken place—the first in December, 1863, when the Rev. J. Maughan delivered a very interesting lecture on "Socrates, and the character of Athens in his time;" the second in March, 1864, when the Rev. Mr. Ibbetson lectured on "Natural Magic," with some curious illustrative experiments. The Lancashire Bellringers, at that time in the colony, were engaged for this soirée, and proved a great attraction. The third soirée was held on June 21, when the Lord Bishop of Adelaide presided, and the Hon. G. C. Hawker, M.P., who had shortly before returned from New Zealand, gave an account of his visit to that colony, and more especially to that part of it which is unfortunately the seat of war. The members of the Deutsche Liedertafel gave their valuable assistance in the musical part of this soirée. The last soirée took place on September 6, when His Excellency the Governor-in-Chief presided, and the Rev. Canon Russell delivered a very interesting and humorous dissertation on "Scottish Humour." The Christy Minstrels were engaged on this occasion. The following lectures have been delived since the last annual meeting, viz.:—"Oliver Cromwell," Rev. W. Harcus; "Coleridge," Rev. Canon Russell; "Mining in Cornwall," J. L. Young, Esq.; "Dr. Johnson," Rev. W. Harcus; "Geneva and Chamouni" (continuation of former lecture), Rev. F. W. Cox; "The Present Conflict in America," His Honour the Chief Justice; "Earth's Buried Cities—Herculaneum and Pompeii," Rev. J. Gardner; "Slavery—Ancient and Modern," the Lord Bishop of Adelaide; "The Circulation of the Blood," Dr. C. Clark; "The Marvels of the Solar Spectrum," Rev. J. Maughan; "Shakespeare's Jesters," J. H. Clark, Esq.; "The Solar Spectrum and its Teachings," Rev. J. Maughan; "The Progress of Music," H. F. Price, Esq. (with vocal illustrations by the Upper Hullah Class); "The Wonderful Properties of Matter" (illustrated by experiments), Rev. J. Maughan. As the last lecture of the spring series for 1863 would have fallen on Christmas Eve, it was thought that an evening of select readings might be more acceptable at that season than a lecture. This idea the kind assistance of several gentlemen enabled the Board to carry out very successfully, the Rev. J. Jefferis delivering a short introductory address on the occasion. A similar arrangement is proposed for the present year. The Institute Hullah Classes, under the direction of Mr. H. F. Price, have made satisfactory progress since the date of the last report. It is hoped that out of these classes, which are well attended, a permanent Choral Society in Adelaide will spring. Mr. Greffrath having left the colony at the end of 1863, the Board appointed Mr. Nootnagel as his successor in the mastership of the German Class, which, however, is not large. The French Class, which had for a considerable time only contained two or three pupils, has finally become extinct. The Board cannot but regret the indifference which appears to exist in reference to these two classes. The Drawing Classes are specially referred to in the report of the proceedings of the South Australian Society of Arts. The Board will therefore content themselves with expressing their satisfaction with the general tone of the instructor's report, although they could wish to see these classes also more generally supported. Four newly-formed country Institutes have been affiliated during the past year, viz.:—Mount Gambier, Moont, Mount Torrens, and Stockport; and two have suspended operations, viz.:—Port Elliot and Yankalilla. The former of these, however, is likely to be re-established before long. Efforts are being made in seven other localities for the establishment of Institutes, most if not all of which are likely to be successful. It sometimes happens no doubt that an Institute is established in a locality where there is not sufficient population to give it a fair chance for existence, and occasionally circumstances of a local and casual nature may lead to failure; but, as a general rule, it may be considered that when an Institute is once established in any locality both means and disposition will be found to keep it in existence; and if, through pressure of adverse circumstances, it should for a time fall into abeyance, it is pretty sure to be re-established before long. The total number of Institutes affiliated to the South Australian Institute and in active operation at the present time is 35. The following statistics of the total number of books, members, &c., of 33 of the country Institutes at the close of 1863 may not be without interest:—Books, 15,665; members, 1,473; income for year, exclusive of Government grant, £1,343. The arrangement for the delivery of lectures to country Institutes appears to give satisfaction, as the number of lectures delivered under it during the past year is greater than in either of the two preceding years during which it has been in operation; 45 lectures having been delivered at 21 Institutes between October 1, 1863, and September 30, 1864. Sub-reports of the proceedings of the Adelaide Philosophical Society and of the South Australian Society of Arts are attached to this report. It is not necessary, therefore, to refer further to those societies in this place.

Museum Department.—The sum of £250 was voted on the estimates for last year in aid of the Institute Museum. It was, however, specially voted for the augmentation of the Mineralogical Department only, and this restriction would have very materially checked the operations of the curator in other directions, had not the Hon. G. F. Angas offered a donation of £50 in aid of the Museum, on the condition that at least an equal sum should be contributed by the public. The sum of £64 was obtained, leaving, after necessary expenses were deducted, £57 to be added to Mr. Angas's donation. This increase to the funds available for the Museum has enabled the curator to make considerable additions to the various departments, more especially to that of ornithology. The vote has been partly expended in the purchase of a collection of minerals from Mr. E. R. Simpson, and of one of fossils from the Rev. J. E. T. Woods, of Penola; besides which the sum of £100 has been remitted to the Agent-General in London for the purchase of various minerals not in the Museum. These will be selected by Mr. Woodward, of the British Museum, with whom the curator has been in correspondence on the subject, and who has kindly promised his assistance in the matter. The annual report of the curator of the Museum gives full details on the various matters within his department. *Library Department.*—In addressing themselves specially to the subscribers to the Library, the Board feel that they are called upon by duty to and sympathy with their bereaved Sovereign, and by affectionate remembrance of her departed Consort, mourned and beloved alike by herself and her people, to refer in the first place to the present which was received during the past year from Her Majesty the Queen, in the shape of a copy of "The Speeches and Addresses of the late Prince Consort," with presentation inscription and Her Majesty's autograph. As the most convenient mode of exhibiting Her Majesty's present to the public, it is for the time placed in one of the cases in the Museum. Eventually a suitable case will be procured, in order that it may be preserved in the Library, where it will doubtless ever be regarded as a most interesting and touching memorial. The "Mammals of Australia," recently published by Mr. Gould, in three volumes, has been received during the year, and, as well as the "Birds of Australia," mentioned in the last report, attracts much attention from visitors to the Library. The statistics of the Institute for the past year are as follows:—The number of volumes circulated during the year was 55,417. The number of volumes in the Library, as stated in the last report, not having been subjected to any deduction on account of books lost and worn out, for the reason therein assigned, it is of course useless to make any comparison of the respective figures at the beginning and end of the present year. The number of volumes at the annual examination, as already stated, was 12,077; add to this 121 volumes then missing but since returned gives 12,198 volumes at that date; 170 volumes of ordinary books and 151 volumes Patent Specifications have been added since the examination, making a total of 12,519. From this must be deducted 175 volumes presented to the hospital and lunatic asylum, which leaves 12,344 as the actual number of volumes in the Library at the present time. The total number of new subscriptions received during the year is as follows:—Quarterly, 218; annual, 42—total, 260. The actual number of subscribers on September 30 was, as nearly as could be estimated, 944. *Report of the Curator of the South Australian Museum on the progress of the Museum during the Year ending September* 30, 1864.—*Aves.*—The birds added to the collection since the last report amount to 250, which, in addition to the 200 mentioned in that report, now make 450 specimens, comprising 280 species of Australian birds, among which are many rare birds from the north-east coast and elsewhere, some of which have been procured by purchase and others by exchange. *Mammalia.*—About a dozen specimens have been added, mostly small animals, natives of the colony. *Pisces.*—Twenty different species of the fish of St. Vincent's Gulf have been presented to the Museum. *Reptilia.*—Numerous additions have been made, principally by exchanging with other museums. The collection now contains several hundred specimens in spirits, among which are many rare and some new species of our reptilia. *Insecta.*—A few specimens have been added from New South Wales, Western Australia, and elsewhere, and some cases of attractive insects from the Indian Archipelago have been kindly lent for exhibition by Mr. C. A. Wilson, and a large collection of Australian Buprestidæ has also been lent by the Curator. *Mollusca.*—A small collection of European land and freshwater shells, also a few Australian shells, have been added to the collection. *Crustacea.*—Donations of several small species of crabs, &c., have been made. *Mineralogy and Geology.*—Many donations have been made of South Australian minerals and fossils, and a small but choice collection of minerals has been purchased, consisting principally of our copper and other ores; also an interesting collection of tertiary fossils from various localities has been purchased, consisting of about two thousand specimens and comprising seven hundred species. *Coins.*—A few coins, among which are some of great rarity, have been presented. *Miscellaneous Articles.*—A large assortment of native mats and other objects of native manufacture have been presented by Mr. George Taplin, of Point Macleay, and several similar objects by Messrs. G. B. and S. Yeates, of Brisbane; also some native weapons, from South Africa, by Mr. C. B. Jacobs. *Abstract of Proceedings of the South Australian Society of Arts.*—In reviewing the doings of the Society for the past year, it may be mentioned that, in pursuance of the plan of quarterly lectures, the first (on "Sculpture") was delivered by his Lordship the Bishop; the next (upon "Engraving") by L. J. Pelham, Esq. Unfortunately, from various causes, these lectures were very poorly attended; and it is suggested that it would be better to make similar lectures form part of the Institute course, or to reserve them until the Exhibition is open. The seventh Annual Exhibition was opened on the 1st December, in the rooms of the Institute, and comprised about 400 works of art. It remained open 27 days, and the total attendance was 2,793 persons. Some days were made free days, and on one of these (the day after Christmas) the attendance was 970 persons. The artists' prize list numbered 24, and amounted to the sum of £76 13s., of which 16 prizes were awarded—there being no competition for the others—and two special prizes were given. The names of the successful artists are G. Hamilton, A. Hunt, C. B. Labatt, J. Macgeorge, C. W. May, R. E. Minchin, J. D. Stone, E. Tomkinson, T. Ward, and E. M. Wilson. The distribution of Art Union prizes took place on the 30th December—the chair being taken by the Hon. John Hart, M.P.—and prizes to the value of £120 were distributed amongst the subscribers. During the Exhibition his lordship the Bishop and Mr. Pelham repeated their respective lectures to numerous and attentive auditories. Subjoined is the report of Mr. Hill, Master of the School of Design:—"I have the honour to report that for the year 1864 the progress of the pupils of the School of Design has been very satisfactory, but a great want of new models is felt, especially by the more advanced pupils. I trust the Society will soon be in a position to supply this desideratum. The total attendance for the nine months of 1864 was 30 students, of whom 14 were male students and 16 female students, and the maximum monthly attendance was 17, while the minimum was 13. The attendance was more equal than formerly. The branches of study were apportioned in the following manner:—From the flat, including outline, 8 pupils; drawing in colours, 5; mechanical and geometrical drawing, 5; drawing from the round, 4; drawing from nature, 4; free-hand drawing, 3; design, 1; total, 30." *Abstract of Proceedings of the Adelaide Philosophical Society.*—At the monthly meetings held during the year papers have been read in the following order:—C. A. Wilson, Esq., on "The Entomology of the East Indian Archipelago and Southern Africa;" His Honour the Chief Justice, on "The Relation of Science and Theology;" Rev. J. Maughan, on "The Microscope;" George Windsor Earl, Esq., F.A.S., on "Artificial Shell Mounds;" Robert Kay, Esq., on "Ingenious Solutions of Mechanical Problems, as exemplified in Sir William Armstrong's Hydraulic Machinery and in Nasmyth's Direct-Action Steam Hammer;" C. A. Wilson, Esq., on "Wood-eating Insects;" B. H. Babbage, Esq., on "The Vital Statistics of South Australia." At the October meeting Dr. Muecke, of Tanunda, exhibited his valuable microscopic sections of Australian woods, at the same time giving much interesting information of a scientific character. The desirability of adding to the library some of the volumes of the "Royal Society's Transactions" and other issues of a kindred character, having frequently been urged by several of the members, it has been resolved to spend, under the direction of the Council, about £50 in standard books bearing on science and philosophy. During the year several new members have been elected, and several valuable reports and scientific papers, received from the neighbouring colonies and Great Britain, have been laid before the Society. In March last a very successful microscopic *soirée* was held—His Excellency the President in the chair—when a large attendance of ladies and gentlemen was secured, and a pleasant evening spent in examining a number of valuable microscopes, diagrams, and books kindly lent for the occasion by the members and other gentlemen interested in science. At this meeting his honour the Chief Justice, on behalf of the Philosophical Society, presented a beautiful and complete photographic apparatus to John Howard Clark, Esq., in acknowledgment of unwearied and valuable services rendered by him during the period of his secretaryship.

DUBLIN INTERNATIONAL EXHIBITION.

Great preparations are already being made by the Executive Committee for the musical part of the opening ceremony, on the 9th May. The orchestra will be arranged after the model of the one at Birmingham. The organ, which will be very large and complete, is building by Messrs. W. Hill and Son, of London. The number of performers will reach 1,000, and the whole will be under the direction of Mr. Joseph Robinson. It is intended to make the music, on this occasion, as great a success as it was at the opening of the first Irish Industrial Exhibition at Dublin, on the 12th May, 1853. Vocalists are to be invited and selected from the choirs in Liverpool, Manchester, Bradford, Leeds, Birmingham, and other towns and districts within easy travelling distance of Dublin.

Manufactures.

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OPERATIVE COACHMAKERS' INDUSTRIAL EXHIBITION.—This Exhibition, which is to be held in the Corporate Hall of the Worshipful Company of Coach and Harness Makers, Noble-street, St Martin's-le-Grand, will be publicly opened on Wednesday, February 1st, by the Marquis of Lansdowne, who is expected to arrive at noon. An address from the Committee of Management will then be read to the chairman of the day, and the Very Rev. H. H. Milman, D.D., Dean of St. Paul's, will offer up a Prayer. An anthem will be performed by amateurs, being coach operatives; at the conclusion of which the chairman will declare the Exhibition open. The amateur singers have kindly offered to sing again during the evening, and occasionally each week during the time the exhibition is open. By permission of Lieut.-Col. Lord Truro, a Guard of Honour of the 4th Middlesex (West London) Rifle Volunteers (Coachmakers' Companies) will attend, under the command of Captain Woodall. The prizes offered by the Society of Arts, the Coachmakers' Company, and others, will be awarded by the following judges:—The Marquis of Lansdowne, Viscount Torrington, Mr. R. C. Mansell, of the carriage department, South-Eastern Railway, and Messrs. Hall, Rock, and Large. The first three were appointed by the Council of the Society of Arts, and the rest by the Coachmakers' Company.

Commerce.

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SUGAR IN SPAIN.—Mr. Consul Marks, in his report on the trade of Malaga, states that the cultivation of the sugar-cane and the crushing, manufacturing, and refining of its juice has increased rapidly during the last few years; all lands capable of irrigation are being converted into sugar-cane plantations within the range of the temperate sea-coast climate, or the provinces of Malaga, Granada, and Almeria, commencing at Marbella on the west coast, and reaching to Adra on the eastern side. The climate appears particularly favourable to its growth, and the canes in some districts reach the largest size attainable by this plant; modern appliances in machinery have given an impulse to this important branch of industry which promises a rapid increase in its production. Notwithstanding that Spain has been supplied with sugar from its rich colonies in the West Indies, there has been and there still exists a protecting duty of 74 reals the 100 kilos, or about 19s. per cwt., levied on all importations from her possessions, and more than double that amount if from foreign sources. It was expected, on the late revision of the Spanish commercial tariff, that this protective duty would have been reduced; but the representatives of the agriculturists and manufacturers of the sugar-growing districts succeeded in preventing this contemplated reduction, which was borne out by statistical information, showing the enormous increase of the national cane plantations and the extent of the capital invested in this twin source of national production and manufacture. In the year 1848 this branch of agriculture might have been considered so trifling as scarcely to deserve mention; but in the year 1862, the production of sugar-cane sent to the respective manufactories may be estimated as follows:—250.000 arrobas from Nerja, 130,000 from Frigiliana, 100,000 from Maro, 350,000 from Torrox, 700,000 from Velez, 300,000 from Malaga, 1,500,000 from Motril, 470,000 from Adra—total, 3,800,000 arrobas. Say about 4,000,000 arrobas, or 45,000 English tons, yielding about 15 per cent. of sugar, or about 6,750 tons of refined sugar. The fanega or acre of land yields about 2,000 arrobas of sugar cane, which, at 14 cuartos, or about 4d. per arroba = rls (vn.) 3,305; expenses of cultivation rls (vn.) 1,500; or about £20 per fanega clear profit to the manufacturer. 2,000 arrobas will produce about 120 arrobas of sugar, which, sold at rs (vn.) 30 each, amounts to rs (vn.) 3,600; from which are to be deducted for expenses, rs (vn.) 1,146; profit, rs (vn.) 2,454, or about £24 profit on the reduction to sugar of the 2,000 arrobas of cane. About 10,000 acres of irrigable land are occupied in the growth of the sugar-cane along the southern coast of the Province of Granada, and these ought to produce 5,400,000 arrobas of sugar-cane. Twenty sugar factories exist in the district before mentioned; eight are first-class establishments worked by steam on the modern system of refinery; the other twelve are on the old plan of refinery, by boiling in the open air. About 5,000,000 of reals, or £50,000, may be considered as the amount of capital invested in the agricultural growth of the cane, and about 40,000,000 reals, or £400,000, in the construction and machinery of the twenty factories and refineries, requiring about 20,000,000 of reals, or £200,000, floating capital to keep them in constant work. The great drawback offered by the French Government to the exporters of French sugars helps in some degree to keep down the profits of the Spanish manufacturer, the drawbacks paid this year on exportations of sugar in France having greatly exceeded the amount received by the French customs on importations of foreign sugar; the introduction of the article into Spain from France amounts to 160,000 arrobas of 25 lbs. each, or 2,000 tons, the drawback enabling the French to undersell the Spanish refiner, although their sugars are amenable to the heavy import duty. Sugar has risen lately in price as much as 8s. the hundred-weight, owing to the failure of the crops in the East Indies creating a deficiency of about 50,000 tons; and to the crops of beetroot in Russia and Poland having likewise proved a failure. In the Havana little sugar remains in consequence of the quantities taken in America. The Brazilian crop being late, will be exposed to the habitual rains at the end of the year. In the West India islands the cane has suffered from a long drought. In the Mauritius and Reunion the deficit is estimated at from 30,000 to 35,000 tons. In Louisiana the yield is quite insignificant. The demands from America are calculated at from 30,000 to 35,000 tons. The beetroot in France is suffering from the attacks of a parasite known as the *uredo betæ*, the destructive effects of which have been increased by the dryness of the past season. The general opinion is that the crops this year will not exceed one-third of the average; while in Spain the lands availed of for the growth of the canes are mostly irrigated from sources little affected by the rainy or dry seasons, and thus the crops have generally been of a fair average production.

Trade with Austria.—The Austrian Government has called upon all the Chambers of Commerce in that country to furnish reports containing the statistics of the trade with England since the Anglo-French Commercial Treaty came in force, the object being to ascertain what effect that Act has had on the imports from Austria into England, and what advantages might be derived from a similar treaty between the two last-named countries.

Exhibition of Fishing Tackle.—The authorities of Boulogne have decided on organising in the course of the present year an Exhibition like that which took place some time since at Amsterdam, of fishing tackle and utensils, and all kinds of instruments connected with the maritime industry of all nations.

Find of Coal in Mexico.—A deposit of coal of the best quality has, it is said, been discovered in the mountains of Itoluca, at the distance of thirty leagues from the city of Mexico, and of sixty from Acapulco. Another deposit was discovered some little time since in the district of Tlajcala.

Colonies.

Gold in Tasmania.—For years past gold has been produced from Fingal in considerable quantities, by odd stragglers, rudely provided with means of searching for it,—yet never sufficiently to infect people with a gold-digging mania and produce a rush. The quartz reefs have been tested by imperfect machinery. They have always turned out more gold to the ton than many of the average reefs that pay well in Victoria; yet, strange to say, they have never been considered of sufficient importance to attract the attention of capitalists, by whom alone they can be profitably worked. The first reef worked by the original Fingal Quartz Mining Company was very paying, twenty, thirty, and forty ounces of the precious metal regularly once a week rewarding the workers for their labour and their research. Flushed with the success of these their primary efforts, it was determined by the original quartz miners to go to work upon a new and more extensive basis. The company was augmented—and its capital increased to £12,000. New machinery, of a most expensive quality, was obtained from Messrs. Russell and Co., the eminent machinists of New South Wales; and works were completed of a very comprehensive character. But, strange to say, from the day of opening no gold was taken from the original reef of the Fingal Quartz Mining Company. This was caused through the machinery being of an imperfect and impracticable character. Since then little has been done to develop the undoubted gold-bearing quartz veins that exist near Fingal. The failure of the extensive company alluded to has so blighted the hopes of many of the Tasmanian colonists, that unless capitalists from the adjoining colonies proceed with the works, little will be done. During the late session of Parliament one of the members for Launceston introduced the matter of the gold fields to the House of Assembly, and asked parliament to grant £2,000 for the purpose of engaging Mr. Hargraves, the eminent gold discoverer, to prospect the country. That hon. member was met by the remark, that there was an Act of Parliament in existence which offered a reward of £5,000 to the person who would indicate the whereabouts in Tasmania of a gold field that was capable of producing, and absolutely produced for twelve months, gold at the rate of 100 ozs. per week. And no member would second the proposition. It was however determined that if Mr. Hargraves would come to the colony they would endeavour to secure his services without government aid. Accordingly public meetings were held, and subscription lists opened, the public liberally responding to the call. When Mr. Hargraves landed in Tasmania, an extraordinary ovation awaited him. The whole country was rejoiced to think that at length, with the aid of the great gold prospector, the question that had so long agitated the public mind would be solved. A most influential deputation waited upon the ministry, and were informed that the Government were anxious and willing to assist them by every means in their power, and that they would place £1,000 at the disposal of the Committee, to be appropriated in the prospect of gold, provided Mr. Hargraves, after his preliminary observations, reported it was necessary. This liberality on the part of the Ministry has been everywhere received with the utmost satisfaction. Mr. Hargraves has departed to Fingal to commence operations.

Notes.

Railway Bridge over the Seine.—The Western Railway of France is now constructing a short line to connect the town of Rouen directly with the Paris and Cherbourg Railway, and the work includes a bridge over the Seine near Elbeuf. This construction will be more than 650 feet long and eighteen feet wide, and will rest on five series of tubular cast-iron piles, with intervals of about 160 feet between them. The bridge itself has been constructed on the banks of the river, and is now being placed on the piles, the entire structure, 200 metres long, being pushed forward by means of very simple arrangements from one side of the river to the other. The operation was commenced some time since, when the end of the bridge rested on the third set of piles after eighteen hours work. The weight of the bridge is given at a thousand tons, and the movement was given by sixteen men. The bridge is the work of Messrs. Schneider and Co., of Creusot, who adopted the same method in the case of the viaducts of Fribourg, in Switzerland, of Romans, on the Isère, and of Saint-Just, on the Ardèche.

College of Organists.—A society under this name has been instituted for the purposes of improving the position, advancing the interests, and encouraging the skill —both in composition and performance—of all who follow the occupation of an organist; and in its sphere of operation is included lectures, concerts, prizes, opportunities for the interchange of opinions among organists, the granting certificates of merit, and such other means as may appear to the government for the time being as best calculated to further the objects of the institution.

CAB INDICATOR.—The French authorities have for a long time occupied themselves with plans for checking the distances as well as the time of public vehicles; the old system of *courses*, single journeys within the limits of the city, has ceased to be fairly applicable since the limits of Paris were extended to the fortifications; the uniform charge for a ride of twenty minutes (for there is now a minimum rate for a journey of not more than a quarter of an hour) and for one of an hour is clearly unjust both to the proprietors of vehicles and to the public, and the circumstances of the case demand a re-adjustment of the system. The municipal authorities of Paris have, therefore, urged the company to which the public carriages belong to use its utmost endeavours to find a means by which payment by distances may be regulated. Many attempts have been made without success, but a metre, invented by MM. Meuley and Verdier, seems to hold out some promise, and three have been placed in cabs belonging to the company. This instrument has two faces, which indicate—First, the distance passed over; secondly, the time occupied in so doing; and thirdly, the stoppages, which are added to the distances at the rate of eight kilomètres, rather less than five miles, an hour. Should this new metre be found to answer in practice, there will be no difficulty between the hirer and the driver, as the former may engage a carriage either by time or distance. But the apparatus attempts more than this; it contains a card, on which it marks all the *courses* made during the day, the time employed, and the number of kilomètres paid for by the public, and consequently the sum which the driver has received. It is declared that all this has been accomplished, and, if so, there is no question that the application of the apparatus will soon become general; but unless the action of the metre is arrested when the carriage is moving, though unoccupied, the driver would stand charged with the distances passed over from and to the stations and the places where he takes up and puts down his fares. This cannot, however, have been overlooked, and it is to be hoped, for the sake of all concerned, that the problem may have been solved.

PHOTOGRAPHIC MAPS.—A map of the town of Grenoble and its environs, embracing twenty square kilomètres, has been produced with the aid of the camera in a very short space of time. The immediate object in view is the obtaining correct topographical profiles for military purposes, and, consequently, the means of placing an attacking force comparatively out of the reach of danger, but maps showing the undulations of the land are of too evident utility to require any special application to illustrate their value. The map in question is made to a scale of one in five thousand, and was entirely produced in Paris from twenty-nine photographic views taken from eighteen different points, by Captain Javary. The stations selected were partly on one side of the river Isère, and partly on the other, and it is believed that not a single accident of the outline has been missed. The extreme elevation of the ground on the right bank of the river is more than three thousand feet. The shortest distance at which a view was taken was about a thousand yards, the greater part were at fifteen hundred yards, and some few as distant as four thousand five hundred. It is stated, on the authority of M. Laussedat, with whom the plan originated, that fitting of the levels is such as could not have been produced by any other known method of expeditious military reconnaissance. The views were taken by two lenses of different focal lengths, namely, one of 50 centimètres, the other of 27. The former was employed for tolerably large representations and objects at a distance, or where it was found necessary to take special notice of details, and the other, which took in a field of 60°, for the shorter distances. The photographic operations only occupied about sixty hours, and the subsequent preparation of the map two months.

Correspondence.

PROPELLING RAILWAY TRAINS ON LINES WITH FREQUENT STATIONS.—SIR,—The paper on this subject read on Wednesday, the 18th inst., and the discussion which followed, do not seem to go far towards a solution of the difficult question of the propulsion of underground railway trains. Mr. Barlow proposes the long-abandoned rope traction, on a new plan, which might be called the "cross-bow" system; while Dr. Bachhoffner would recommend what he calls the "tea-urn" principle, on a rather large scale; others, again, advise the adoption of what may be called the "Enterogaster" engine, which is not only to swallow its food and water, but to digest and consume its stomach also. Mr. Barlow's plan is undoubtedly practicable, though occasioning a certain waste of tractive power; but the great objection is that with rope traction the driver does not accompany the train, and this, therefore, will never become popular. The expense of Dr. Bachhoffner's recommendation would, if practicable, absorb the whole revenue of the company, and leave nothing for profit and repairs. Lastly, the engine that is to swallow its own breath and smoke would appear to be quite contrary to nature, and approaches somewhat to the character of that grand desideratum of patentees and inventors, the perpetual-motion machine. The professed object of these and other contrivances is to obviate the vitiation of the atmosphere of tunnels. Now, the air in the tunnels of the metropolitan lines is quite as pure and wholesome as the atmosphere above ground, as must be the case from the ends of the tunnels being open, the frequent air shafts, and rapid passage of the trains both ways. But those tunnels are subject to the inconvenience which attends all open-air trains in an equal if not greater degree, the intolerable and disgusting nuisance of the present system of brakes. The burning of the wooden chock on the iron wheel produces a sulphurous stench that is almost unbearable, even in the open air; and it is a singular fact that none of the contrivances of engineers and inventors tend at all to diminish this evil, but rather to increase it. There are only two practicable modes known to us at present of avoiding the necessity of carrying a coke furnace through the tunnels,—the vacuum system, originally invented by Mr. Vallance, of Brighton, of sucking the entire train, with its load, through the tunnel; and the compressed-air locomotive. Vallance's plan is essentially economical, as a two-inch vacuum is amply sufficient for the heaviest loaded train. Its durability is unquestionable, but it is scarcely adapted for repeated stoppages at short intervals. The compressed-air locomotive is perfect in every respect, and, therefore, deserves every attention from inventors and improvers. Common air may be compressed to any degree of density with facility and economy by means of the triple compound condenser. The portable reservoirs, or salamanders, can be taken out, and charged ones replaced, in far less time than taking in coke and water, not to mention raking the fire bars. The extraordinary lightness of the compressed-air locomotive cannot be allowed to be an objection, because the whole train of carriages may be lightened in the same proportion. The enormous quantity of iron and oak introduced in the manufacture of an ordinary railway train car is quite absurd when considered in reference to the load carried,—less than two tons,—a load that is carried on common roads in vans not a quarter the weight of a railway car. The standard objection to the compressed-air locomotive is the assertion that no salamander of practicable size would carry a train more than two or three hundred yards. But if that assertion be founded on fact, which is very doubtful, why are not our inventive powers directed to the improvement of the air locomotive, and the general lightening of the machinery and construction of railway trains? The obvious answer to this question is the formidable fact that change of system is abhorrent to the vested rights of patentees, holders of immense stocks of moulding and other patterns, and the rolling stock of existing companies.—I remain, &c., Henry W. Reveley.

January 23rd.

Propelling Trains on Lines with frequent Stations.—Sir,—If I understand Mr. Barlow's meaning rightly—and I am by no means sure that I do—for, like the old Scottish lady, I feel "it is a sort o' presomption to onnerstan the meenister," his new proposition of working railways is by a sort of kick, or succession of kicks, to the train, not directly, as in the plan of Mr. Pilbrow, shown in the Exhibition of 1862, but indirectly through the agency of a rope, to be acted on by a steam-engine driving a pair of wheels to haul on the rope; or by Sir W. Armstrong's water column; or by some other means. But the essence of it is to put in practice the principle of the tennis or cricket ball—a sudden shock instead of a gradual movement. When we play at bowls, using the muscular force of the arm as a propeller, the bowl is a rigid block of wood, and takes no harm, because there is a gradual force applied. So also when we strike a billiard ball with a cue. But with the cricket bat or racket we use an elastic ball. With Mr. Barlow's huge bat, weighing forty tons, we must give a very powerful elastic recipient to the train, to elude the shock and prevent the breakage of the rope. We must also attain great skill in striking the blow, to be sure we drive the train-ball far enough. But even then there seems a difficulty. Mr. Barlow's objection to the locomotive is that it is gradual in attaining speed; but we can carry that speed on for any length of time when attained. On Mr. Barlow's system we are supposed to start with a given velocity, but that velocity goes on gradually decreasing, and unless there be a succession of batters, there would be the risk of stopping midway before arriving at a station. And for this Mr. Barlow's remedy is a supplementary locomotive, and of course rails for it to run on, and sidings to get out of the way. Experience in the use of ropes for traction rather points to the use of slow motion, to avoid breakage; but as Mr. Barlow aims at increased speed he will have to provide such an amount of elastic action to graduate the force as will seriously detract from his incipient speed. All that Mr. Barlow can gain is the saving of the dead weight of the locomotive; but, so far as we can discern, this will be more than counterbalanced by other disadvantages. It is true that there may be more in the scheme than we have yet perceived, but as Mr. Barlow has not shown us a specific mechanical plan, and the whole is a question of mechanical structure, and his explanations have not been remarkable for lucid clearness to common understandings, we must wait in patience for further information. Mr. Chubb is quite right in saying that "the motive power should accompany the train;" but whether, under the necessity of getting rid of noxious gases, this can be accomplished by external power generated and transferred to the machine, is still a problem, whether in the form of compressed springs, or air, or highly elastic steam. If external power is to be applied in the shape of haulage, the most promising is the exhaust system of Vallance, a variation of which is now being experimented on by Mr. Rammell. If wire saucers in the shape of sheeves were used to carry a rope in the tunnel, as on the Blackwall, the noise would be something fearful. Train resistance by gravity, mechanical friction, and atmospheric impediment in the tunnel, up the gradient of 1 in 100, is stated by Mr. Burnett to be 66 lbs. per ton. If this resistance could be reduced there would be more advantage than by Mr. Barlow's plan. Supposing the ordinary resistance up 1 in 100 to be 40 lbs. per ton, there is 26 lbs. surplus arising from atmospheric resistance and train friction, and it is worth while considering how far the latter may be reduced. Reducing resistance is equivalent to reducing the consumption of fuel and the production of noxious gas. Practically, so long as the Great Western and Great Northern are to run ordinary engines over the metropolitan lines, the only question worth considering is, how to prevent the destruction of rails and tires.—I am, &c., W. Bridges Adams.

Petroleum as Steam Fuel.—Sir,—Much interest is still expressed by our naval authorities, and by others connected with steam navigation, as to the proposed use of petroleum as fuel; and there is such a desire for information on the subject by many who confess being unable to judge as to the merits of this project, though they fully appreciate the importance of any mode of improving or economizing the use of fuel and augmenting its efficacy in practice, that I should be obliged if you would allow me to make some comments upon the subject more especially in reference to the position it has now assumed. The data relating to the comparative calorific power, or heating capability of petroleum and of coal, which I have already referred to,* are not disputed by the advocates for the use of petroleum as fuel; on the contrary, they are adopted by them. So far, therefore, we are unanimous. But, in reply to the objection which I have urged on the ground of cost, they suggest that the price of petroleum might perhaps be reduced if it came to be used as fuel; and if not, they believe that the lower cost—£10 to £12 per ton—at which a material almost identical with petroleum may be obtained from coal, would admit of that being used for fuel. So far as the price of petroleum is concerned, I am disposed to consider any anticipation of a reduction in price extremely delusive; and in reference to the lower price of coal oil, it will be sufficient to say that it would merely render the substitution of that material for coal less disadvantageous than a similar use of petroleum, and that the comparison between these materials, as fuel, would still be considerably in favour of coal. But the chief argument in favour of using petroleum as fuel is, that this material admits of being used for that purpose, in a manner so much more advantageous than is possible in the case of coal, that the disproportion in the cost of the two materials would be more than counterbalanced. They contend, also, that the relative advantages of petroleum and of coal cannot be determined by theoretical considerations, relating to the respective heating capabilities of these materials, and that they must be measured by the effects which can be produced in the two cases. In fact, the subject must be considered practically, and not theoretically. With this view I fully concur, and for that reason I regret that no practical evidence of the comparative effects or duty obtainable with petroleum and with coal, has yet been brought forward. It was only from the want of such practical evidence that I was led to have recourse to a theoretical consideration of the relative heating capabilities of petroleum and of coal, as the only accessible criterion by which an opinion could be arrived at as to the very startling statement that a ton of petroleum is equal to five tons of coal as fuel, and by which the wonderfully erroneous nature of that statement could be rendered apparent. It would have been far more satisfactory to myself to have based my opinion upon the results of trustworthy experiments, representing the actual duty obtained with petroleum and with coal. Nor can I refrain from expressing my surprise that a statement so extraordinary as that I have referred to should have been put forward ostensibly as the result of experiments in the Government Dockyard, with an appearance of authority which it acquires from the mode in which it has been made public, and without a vestige of practical evidence to support it. This is indeed the more remarkable from the fact that the advocates of petroleum appear to have been quite cognisant of the proper mode of instituting a practical comparison between different kinds of fuel. In the absence of such evidence, mere argument and assertion have but little value, and it is incumbent on those who have excited an interest in this subject to put their views to the test of experience, and either to substantiate them satisfactorily or ackowledge their error.

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*See *Journal*, Vol. XII., p. 311.

But, in reference to the possibility of using petroleum as fuel more advantageously than coal, there is a means of instituting a practical comparison between them, which, in the absence of any more direct criterion, is deserving of notice. It is well known that no kind of fuel is burnt under ordinary circumstances so as to realise the whole of the heating effect it is capable of producing. The true comparison between different kinds of fuel is, therefore, not what they can do, but what they really do in practice. The actual work done by any kind of fuel depends partly upon its nature, partly also upon the kind of effect to be produced. When coal is burnt in smelting iron, for instance, the amount of its heating capability which is actually utilised, is not a tithe of that which is utilised when coal is burnt in an ordinary domestic grate; but in the one case the effect to be produced is the maintenance of an intense degree of heat; in the other, moderate warming only is required. In burning coal under the very unfavourable conditions which obtain in a marine-boiler furnace, experience has shown that there is a great difference in the duty or effect produced by equal quantities of different coals possessing equal heating capability. Hence the recognised practical superiority, for steam-vessels, of Welsh steam coal over the more bituminous kinds of coal represented by North Country coal. Now, what is the difference between these two kinds of coal to which their different value as steam fuel is referrible? It is simply this; the Welsh coal is almost entirely fixed, approximating in this respect to pure carbon; it does not give out much combustible gas when heated, but it burns almost entirely within the furnace, and, unless the rate of combustion be very rapid, it burns completely, generating its full equivalent of heat, which is transferred, through the medium of the combustion products, to the water in the boiler. But bituminous coal, though of equal heating power, contains from 30 to 40 per cent. of volatilisable substance, and consequently, when heated, it evolves combustible vapour or gas to that extent; and this, mixing with the combustion products, is thereby rendered less readily combustible, and before it can be burnt it is drawn into the tubes of the boiler, where the flame is extinguished partly by the cooling of the gas and partly by the want of air, so that, instead of generating its equivalent of heat, it produces soot and smoke. This action takes place to some extent with all coal, especially when it is burnt under such unfavourable conditions as obtain in a marine-boiler furnace; but it is the degree in which it takes place that determines the relative value of different coals for steam navigation. The more a coal is capable of being burnt within the furnace the better it is for this purpose. The greater the amount of volatilisable substance it contains, the less suitable is it, and the greater is the extent to which production of soot and smoke is substituted for the production of heat; and, as these are correlative results, it follows that the fitness of coal for steam navigation is inversely proportionate to the amount of volatilisable substance it contains. At least this is, within certain limits, the case as regards the kind of boilers now in use. Applying this result of long experience to the case of petroleum, the conclusion which it leads to is even more disadvantageous for that material, as compared with coal, than the comparison of their theoretical capabilities; for petroleum is altogether volatilisable, and consequently it appears to me that there is nothing more incompatible with the use of petroleum as fuel than the conditions which obtain in a marine-boiler furnace. Doubtless it will be said in regard to this opinion that a peculiar boiler is contemplated for petroleum, but as to that nothing need be said until we are in possession of results indicating the evaporative effect attainable with petroleum as compared with coal. The signal misconception which characterises the views of those who advocate the substitution of petroleum for coal in steam navigation was most strikingly illustrated during the discussion which followed the papers read on this subject by Capt. Selwyn and Mr. Richardson, at the United Service Institution; and to show the confusion of ideas prevailing on the important subject of fuel, I need only mention that Sir Edward Belcher referred to the oxhydrogen flame, as proving the fuel value of hydrogen to be much greater than that of carbon or of coal. Nothing could possibly be more irrelevant, and it can only be inferred that Sir Edward Belcher is not aware that the thermal efficacy of the oxyhydrogen flame is solely due to the fact that oxygen gas is used in the place of air in the combustion. This circumstance alone places the case of the oxyhydrogen flame beyond the range of a practical consideration of the subject, and so far as comparison can be instituted between hydrogen and carbon when burnt with oxygen in place of air, the fact is that the thermal effect or temperature produced by carbon under that condition is far greater than that which is produced by hydrogen; these effects being in the ratio of about 10 : 7 for equal weights of carbon and of hydrogen. When these substances are burnt with air, the difference in thermal effect is inappreciable. Capt. Selwyn's reference to the common fish-tail burner used for illumination, and to the Bunsen burner used for heating, as being illustrative of the different effects obtainable by burning combustible substances under different conditions, was equally infelicitous; for in the flame of the fish-tail burner, and in that of the Bunsen burner, the heating effects produced are equal for equal quantities of gas burnt, and the thermal effects or temperatures produced are but little, if at all, different. The feasibility of the same gentleman's opinion as to the possibility of substituting coal oil for coal as steam fuel, may also be illustrated by the following simple consideration. Of the very richest oil-yielding Cannel coal—the Leeswood Cannel—about three tons are required to produce one ton of crude oil. In the production of this oil a considerable quantity of combustible gas, capable of generating a large quantity of heat, is lost, and there remains the greater part of the carbon of the coal in a state of coke, amounting to much more than one ton. So that the true fuel value of the oil from three tons of coal is really the fuel value of that quantity of coal, *minus* the fuel value of the coke and gas. Now, according to the representations made in favour of substituting coal oil for coal as fuel, one ton of oil is expected to do the work of five tons of coal; so that, according to this view, the fraction of the heating power belonging to the three tons of coal will be equal to the heating power of five tons of coal! This is equivalent to the proposition that half three is equal to five, and is comparable in absurdity with the wildest speculations concerning perpetual motion. That such a common-sense view of the subject should have escaped the perception of the gentlemen who propose to improve and economise the use of fuel, so as to bring about an entire reorganisation of our navy, and of steam navigation, is a fact which indicates a most woeful deficiency of acquaintance with the subject, and which well illustrates the proverbial danger of a "little knowledge." In conclusion, I would recommend the advocates of the use of petroleum to have recourse to that practical mode tof deciding any question there may be in their minds as o the relative fuel value of petroleum and of coal, which I fully agree with them in thinking is the only satisfactor y test, and which I have no doubt will bring them that conviction which is consistent with the real facts of the case.—I am, &c., B. H. Paul.

8, Gray's-inn-square, Jan. 18.

Hot-Air Blast from Copper instead of from Iron Tubing.—Sir,—I have lately made some experiments, and think that hot air from copper will do good service in the manufacture of colonial sugar. 1st. By **heating** the cane in chambers so as to decrudify or unraw the whole; previous to crushing in the mill; the effects will be softening of the cane, and rendering it so as to give forth its juice devoid of admixture with glucose or such like, which causes decomposition to the juice, and necessitates the use of lime to temper or rectify such acidity, 2ndly. The hot air will do to force into juice in earthenware pans, and so effect concentration without burning, as at present, with fire underneath vessels. Copper tubes are more ductile than iron, can be more readily mended, and never burst.—I am, &c., C. M. Dick, Sugar Planter, late of Trinidad.

MEETINGS FOR THE ENSUING WEEK.

Mon. ...Society of Arts, 8. Cantor Lectures. Mr. B. Waterhouse Hawkins, "On the Reproduction of Natural Forms by Art and Manufacture." Lecture V.
Actuaries, 7. Mr. Peter Gray, F.R.A.S., "On a Table for the Formation of Logarithms and Anti-Logarithms, to Twelve Places of Decimals." (Part 2.)
R. United Service Inst., 8½. 1. Lieut. Walker, "Coast Railways and Railway Artillery." 2. Mr. T. Wright, "Models of Railway Artillery for Coast Defence."
Tues. ...Civil Engineers, 8. Discussion upon Mr. Hawthorn's Paper, "On the Docks and Warehouses of Marseilles."
Anthropological, 8.
Royal Inst., 3. Prof. Tyndall, "On Electricity."
Wed. ...Society of Arts, 8. Mr. J. Chalmers Morton, "On London Sewage from the Agricultural Point of View."
Pharmaceutical, 8.
R. Society of Literature, 8½.
Thurs...Royal, 8½.
Antiquaries, 8.
Linnæan, 8. Mr. Charles Darwin, "On the Movements and Habits of Climbing Plants."
Chemical, 8. Dr. Hofmann, "On Lecture Illustrations."
R. Society Club, 6.
Artists and Amateurs, 8.
Royal Inst., 3. Prof. Tyndall, "On Electricity."
Fri.......Philological, 8.
Royal Inst., 8. Dr. Odling, "On Aluminium, Ethide, and Methide."
Archæological Inst., 4.
Sat.......Royal Inst., 3. Prof. Marshall, "On the Nervous System.',

Patents.

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From Commissioners of Patents Journal, January 13th.

Grants of Provisional Protection.

Power looms—3200—E. Fielding.
Pumps, ordinary lift and force—11—M. Benson.
Railway carriages, lamps for—3212—J. Parkinson.
Railways, communication between passengers and guards travelling on—3109—A. R. Croucher.
Railways, fastenings for—3233—M. A. Muir and J. McIlwham.
Railways, girders for—3243—E. Shufflebotham,
Railway trains, apparatus for signalling in—3227—W. H. Preece and A. Bedborough.
Railway trains, signalling between the passengers and the guard and driver of—3218—W. Buttrum.
Railway wheels, construction and fitting of—3202—E. Leahy.
Rotative motive power—3247—E. Couprant.
Saws—3072—G. Rooper.
Ships, saving from sinking—2179—J. Smith.
Spectacle frames—2655—P. A. Le Comte de Fontainemoreau.
Stamping apparatus—3051—A. Albert.
Steel and iron, manufacture of—3073—J. Ramsbottom.
Tea-pots, coffee-pots, &c.—3206—T. Robinson.
Textile fabrics—3157—P. Cameron.
Umbrellas, &c., top notches and runners for—3220—H. Johnson.
Water, &c., apparatus for measuring—3145—C. W. Orford.
Yarns, mode of treating warped—3226—W. Holms.

Invention with Complete Specification Filed.

Ordnance, construction of—54—H. Ames.

From Commissioners of Patents Journal, January 20th.

Grants of Provisional Protection.

Artificial fuel—81—D. Gattafent and F. Pontifex.
Artificial manure, manufacture of—3161—S. P. A. de Brocalde d'Eluza.
Axles, apparatus for lubricating—6—J. Smith, jun., and J. Williamson.
Belt for ladies' wear—17—L. Goldberg.
Beverages, preparing and keeping aerated—39—T. Pickford.
Bones, extracting and purifying fats from—93—A. G. Lock.
Boots and shoes, shaping and trimming the heels of—49—G. Haseltine.
Bread, apparatus for making aerated—3184—R. L. Howard and J. Dauglish.
Bricks, manufacture of compressed—77—H. Chamberlain.
Carding engines—3253—J. Ladley.
Colour printing—3093—C. Hancock and S. W. Silver.
Cotton gins—2745—H. V. Scattergood.
Dentistry, painless—3229—J. D. Morrison.
Dyeing and printing, aniline colours for—3045—E. T. Hughes.
Eggs, keeping the substance of, fresh and sweet—47—W. C. Thurgar.
Enamelled glass, manufacture of—12—W. G. Helsby.
Enamelled wares, manufacture of—3242—B. Baugh.
Fibrous materials, flyers for preparing—69—R. A. and G. H. Lightoller.
Fibrous materials, machinery for combing—3210—T. Whitley and J. Jowett.
Furnaces, &c.—51—J. Robertson.
Gas, carbonic acid—3102—A. P. Price.
Globes, geographical—3244—E. Perce.
Hair, apparatus for brushing—3246—A. C. Robb.
Hair, brushes for the—61—T. Horrex.
Horse shoes, machinery for making—3254—W. E. Newton.
Hydrometers—75—E. W. Ladd and L. Oertling.
Iron pipes, &c., apparatus for cutting—85—W. E. Gedge.
Jack and slubbing frames—63—A. Barlow.
Jewellery, &c., manufacture of cases for—3258—R. Quin.
Joints, cutting at one operation dovetail and mitre—3228—R. H. Leese.
Knives, cleansing and polishing—26—G. Kent.
Lint, manufacture of—73—S. S. Brown.
Liquids, apparatus for measuring—20—W. Payton.
Locomotive steam engines—3232—J. Millar.
Locomotive engines—35—J. E. Wilson.
Looms—43—J. A. Castree.
Manures, manufacture of—3256—T. Richardson.
Mattress or bedstead, elastic—87—W. E. Gedge.
Meat, preservation of—79—T. B. Belgrave.
Motive power, obtaining and applying—3260—C. W. Siemens.
Ornamental fabrics, weaving—45—J. Craw and J. Macaulay.
Paper, machinery for smoothing or finishing—8—J. R. Crompton.
Perambulators—14—H. Lloyd.
Pictures, mounting—10—F. Gye.
Pistons, elastic packings for—19—E. Keirby.
Plates and strips of metal, machinery for flanging—3216—G. Alton.
Pneumatic apparatus—3230—G. Edwards.
Pneumatic apparatus, portable—16—T. J. Ashton.
Printing machinery—2863—W. E. Newton.
Projectiles—3240—R. Cail.
Railway carriages, construction of—95—R. Chidley.
Railway clerks, checking the receipts of—28—W. H. Roy.
Sails, reefing and furling—83—H. Coutanche.
Sewing machines—3238—J. H. Johnson.
Sewing machines—2—T. A. Macauley.
Sheds, railway stations, &c., construction of roofs for—3250—T. Bouch.
Steam and heat, apparatus for generating—33—J. M. Kirby.
Steam boilers, float for indicating the level of water in—3234—J. and W. Truswell.
Steam engines—3239—W. Nalder and A. Belcher.
Steam hammers—89—J. Ramsbottom.
Taps—67—J. Calkin.
Tubular boilers, construction of—37—J. C. Amos and W. Anderson.
Velvets, &c., box for preserving—3154—W. E. Gedge.
Vessels, apparatus for propelling—29—W. Watson.
Volatile fluids, lamps for burning the vapour of—41—J. C. Bayley and D. Campbell.
Watches, construction of escapements for—53—G. Reymond,
Wood, preservation of—3192—J. Bethell.
Yarns, finishing cotton heald and other doubled—3186—J. B. Edge and E. Hird.

Patents Sealed.

1846. J. C. White.
1852. E. Peyton.
1859. F. L. Lyne.
1897. J. F. Hearsey.
1904. F. E. B. Beaumont.
1921. S. Hawksworth.
1956. G. Leyshon.
1963. N. McHaffie.
1985. J. Grice.
2144. E. Petito.
2486. C. H. Collette.
2594. L. H. G. Ehrhardt.

From Commissioners of Patents Journal, January 24th.

Patents Sealed.

1854. T. B. Heathorn.
1872. R. Couchman.
1877. A. Prince.
1880. E. Brimson.
1882. J. Livesey and J. Edwards.
1883. H. Moon.
1889. J. Nicklin.
1894. H. McEvoy.
1896. H. J. Distin.
1898. G. A. Huddart.
1933. A. Bain.
1951. J. Heydon.
1981. W. Clark.
1982. W. Clark.
2003. J. Adams, J. Webb, and J. J. Monteiro.
2041. B. B. Stoney.
2359. L. Alexander and W. B. Nation.
2460. B. Margulies and J. K Leather.
2565. W. E. Newton.
2973. C. J. Falkman.
3047. W. E. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

123. T. Myers and E. Myers.
135. J. J. Stevens.
149. R. O. Doremus and B. L. Budd.
156. G. T. Bousfield.
361. J. J. McComb.
151. J. A. Knight.
145. A. Lamb.
155. H. B. Barlow.
158. A. J. Martin.
183. J. Cornforth and B. Smith.
206. S. A. Carpenter.
239. W. E. Newton.
308. J. B. Payne.

Patents on which the Stamp Duty of £100 has been paid.

81. T. Hamilton & J. Hamilton.
110. P. Wilson, S. Northall, and T. James.
112. H. Smith.
352. J. Chatterton.
122. William Weild.
100. C. Rishworth.